ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1906.

# VIII.—PLANT DISEASES.—IV. DISEASES OF BEET AND MANGOLD.

It is a common saying among horticulturists and others that long-continued cultivation of a particular species of plant makes it more susceptible to disease than is the case with the same kind of plant growing in a wild state. As a rule there is no real evidence in support of such an opinion.

Exhaustion of the soil is a favourite explanation of "beet-sickness," "clover-sickness," &c., but numerous exhaustive analyses of the soil have clearly demonstrated that the essential constituents of the soil have not been lacking; and, furthermore, the addition of fertilizers has not reduced the diseases alluded to. On the other hand, these diseases have been clearly traced to the direct action of animal or fungus parasites, and when these were removed the disease disappeared.

The following is an attempt to deal in an intelligible manner with some of the most destructive parasites attacking beet and mangold, accompanied by a description of the methods that experience has proved to be most effectual in checking the same.

## Beet Canker.

(*Pionnotes betae*, Sacc.)

This fungus sometimes destroys stored beet and mangold, especially if sweating has occurred. Small scattered glairy, dingy yellow spots first appear on the surface of the root; these soon spread and run into each other, forming irregularly shaped, nodulose, subgelatinous crusts up to one and a half inches across, varying in colour from ochraceous to orange.

Owing to the cells of the beet being disorganised and used up by the mycelium of the fungus large cavities are formed, and, aided by myriads of bacteria, the root soon becomes watery and rotten, at the same time exhaling a very unpleasant odour. Adjoining roots are quickly attacked, and if the disease appears soon after the beet are stored a large percentage is often lost.

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FIG. 1.—Beet canker. 1, appearance of a diseased beet; 2, section through a diseased wart; 3, fruit of the fungus; 2 and 3 highly magnified.

In some few instances I have detected this fungus on beet that have not yet been lifted.

The substance of the fungus consists of a dense mass of slender threads or hyphæ imbedded in a glairy substance, the whole forming a subgelatinous crust two to three lines thick. When mature the entire surface of this crust is covered with a dense mass of colourless, narrowly spindle-shaped, slightly curved three-septate conidia. These conidia germinate quickly on a moist surface when mature; a small number on the point of a lancet inserted into the flesh of a perfectly healthy beet formed a disease-patch one inch across in 11 days.

This fungus also attacks potatoes, as I have proved by repeated inoculation experiments, and it is probable that the frequent cases of rotten stored potatoes is caused by the parasite under consideration, which, judging from the description given, appears to be identical with the fungus called *Pionnotes rhizophila*, Sacc., said to attack potatoes and dahlias.

*Preventive measures.*—Great care should be taken not to include roots showing symptoms of the disease when storing; furthermore, the roots should be thoroughly dry, so as to avoid any possibility of sweating in the pit. From personal observation, also from information, I find it appears to be a common practice when removing stored roots to either leave diseased specimens on

the ground to rot and disappear, to take them to the piggery, or to throw them on to the manure heap. All methods are equally unsatisfactory, as the mycelium and conidia present continue to grow, and being spread far and wide endanger future crops. The only safe method of dealing with such diseased material is to bury it without delay.

## Beet Rust.

(*Uromyces betae*, Kühn.)

This fungus occurs on mangold and beet, also on wild beet (*Beta maritima*), and when present in quantity the crop is considerably reduced owing to the destruction of the leaves, whereby the root is arrested in its growth, and the amount of sugar considerably lessened.

The three stages in the life-cycle of the fungus are all produced on the same plant. The aecidium or "cluster-cup" condition appears in spring on the leaves and leaf-stalks under the form of minute cavities or cups with white torn margins, which are usually arranged in groups on a pale spot. The cups when mature are filled with yellow spores. Other minute bodies called spermogonia, whose use is unknown, precede or accompany the aecidia.

The aecidiospores, scattered by wind, rain, or the movements of animals, are deposited on other leaves of the host, where they germinate, enter the tissue, and in a short time give origin to numerous minute warts that burst when mature, and liberate little heaps of brown uredospores, which are often so abundant as to give to the surface of the leaf the appearance of having been sprinkled with snuff.

It is this uredospore stage that does the damage to the crop. The uredospores are produced in immense numbers, and are capable of germination at once, are dispersed wholesale, and infect the crop with great rapidity when conditions are favourable, the requirements being moisture on the surface of the leaves and some means of spore dispersion.

Later in the season the teleutospores, representing the third form of spore produced by the fungus, are formed in small clusters on the leaf-stalks, or sometimes along with the uredospores. The teleutospores remain in an unchanged condition until the following spring, when they germinate and infect the leaves of young beet plants, giving origin to the aecidium stage of the fungus.

*Preventive measures.*—Removing the leaves bearing aecidia or 'cluster-cups" is effective, as the aecidiospores give origin to the uredo stage, which, as already stated, is the condition that does the real damage to the crops. Where hand picking is out of the question, on account of the large quantity grown, spraying on the first appearance of the disease with dilute Bordeaux mixture or with a solution of potassium sulphide will check the spread of the disease.

The disease is not present in the seed, although its early appearance on seedlings has led some to suppose this to be the case. The crop always commences perfectly free from disease, and its appearance is due to the plants having been infected by teleutospores formed during the previous autumn. Rotation of crops does much towards guarding against the disease. If beet or mangold be sown on ground that produced a diseased crop the previous season infection is almost certain to result, since, however much care may be exercised in removing all diseased leaves, numerous teleutospores are certain to fall to the ground, where they remain unchanged until the following crop is ready for infection. It is therefore advisable not to grow the same crop for two years in succession on the same ground.

Badly diseased beet-leaves are injurious to stock, and even if this were not the case it is perfectly certain that when such leaves are placed in the piggery, or given to cattle, myriads of teleutospores in a condition for germination are placed on the land along with the manure, and a diseased crop is the result. The safest, and in the end the most economical method is to collect all diseased "tops" that are twisted off when the roots are lifted and bury them; the small amount of fodder or manure so sacrificed is certainly much less than the risk—almost a certainty—of having an infected crop the following season.

## Leaf Spot.

(*Cercospora beticola*, Sacc.)

Probably the most destructive leaf disease to which beet and mangold are subject. The first external indication of the fungus is the presence of numerous minute, roundish pale spots on the leaves and leaf-stalks. These spots continue to increase in size for some time, becoming irregular in shape, and often run into each other, forming large irregular blotches which are pale at first, and often bounded by a dark line; eventually these blotches, which show on both sides of the leaf, become darker in colour, and the entire leaf becomes almost black, shrivels, and dies.

If a diseased spot is examined under a magnifying glass very minute erect hair-like bodies are seen on the surface, and under the microscope these tufts are seen to consist of clusters of pale brown fungus-threads or conidiophores, each bearing one or more long, slender reproductive bodies or conidia. These conidia are dispersed at maturity and infect neighbouring plants. It is stated that those conidia that are carried to the ground by rain or on fallen diseased leaves remain alive during the winter and infect young beet plants the following season.

As a rule the plants are not killed outright by this disease, but the growth of the root is checked, hence the total yield is reduced. From the evidence afforded by analysis Professor Pammel, an American vegetable pathologist, remarks as follows in regard to sugar beet:—"I think it is safe to say that the amount of sugar in the beet itself is scarcely diminished. The loss comes mainly from a smaller amount of the total product."

FIG. 2.—Leaf spot. 1, appearance of a diseased leaf ; 2, fruit of the fungus, highly magnified.

*Preventive measures.*—Spraying with Bordeaux mixture checks the disease if operations are commenced on the first appearance of the fungus. The following results of this method are recorded in the New Jersey Agric. Coll. Expt. Station Report, 1896 :—"The foliage of the bordeauxed plots was not materially injured, and when harvested showed an increase in weight over the average of the two checks of 77·5 per cent. The root systems of the sprayed plot showed a corresponding increase of 46·5 per cent."

Diseased leaves should not be allowed to decay on the ground, otherwise the conidia present would be likely to inoculate a succeeding crop.

## BEET MILDEW.

(*Peronospora Schachtii*, Fuckel.)

The young heart-leaves of beet and mangold are frequently attacked by this fungus, which, when present in quantity, often kills the plant when favoured in its development by damp

weather. Its extension is checked by a spell of dry weather bu even under those circumstances plants that have been attacked contain but a small amount of sugar.

The fungus appears as a very delicate lilac-coloured mould, which frequently covers the entire under surface of the leaf, and in some instances appears also on the upper surface. Infected leaves are readily recognised by being deformed and twisted, and by the presence on their under surface of the mould, which consists of a dense forest of slender threads emerging through the

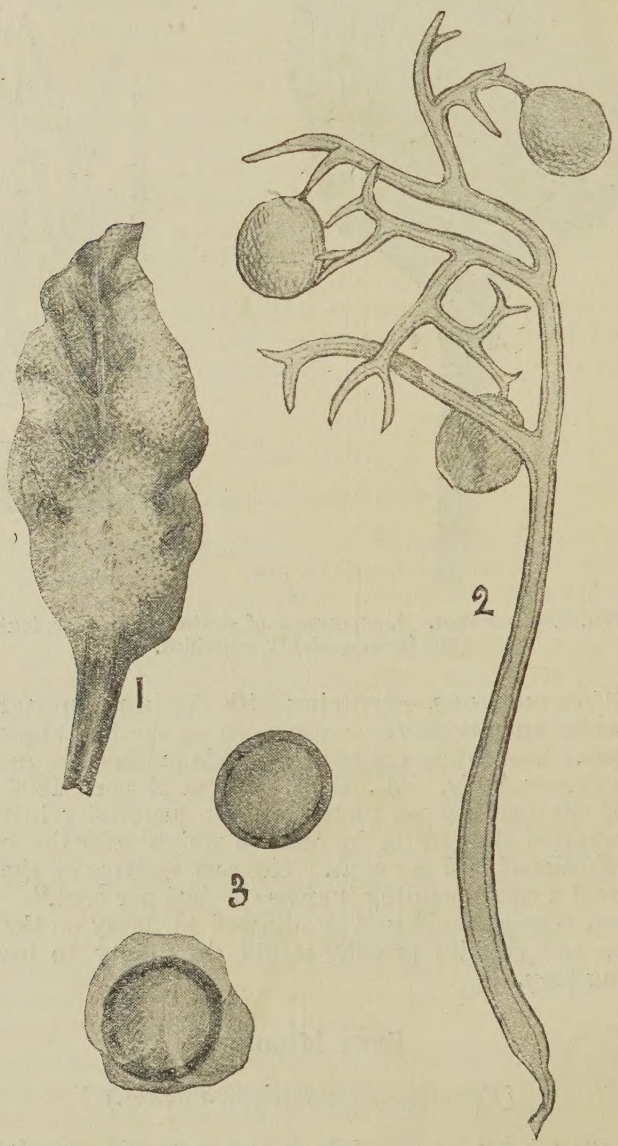


FIG. 3.—Beet mildew. 1, appearance of a diseased leaf; 2 summer fruit of the fungus; 3, resting spores of the fungus; 2 and 3 highly magnified.

stomata, each thread being much branched at its tip, and each branch bearing a minute elliptical conidium or reproductive body. These conidia are carried by wind or washed by rain from one leaf to another, where they germinate, and soon form a new centre of disease, from which conidia are liberated in rapid succession and in great numbers. In addition to the surface mould other bodies called oospores are formed on the mycelium of the fungus present in the tissues of the leaf. These bodies are carried to the ground by the decaying leaves, where they remain unchanged until the following season, when they germinate, and if beet or mangold be present the plants are infected.

*Preventive measures.*—Avoid sowing beet or mangold on ground that has produced a diseased crop of the same kind the previous season ; in fact it is not good policy under any conditions to attempt two root crops on the same land in succession.

It has been suggested that when plants have been attacked by the fungus and have afterwards recovered, the mycelium hybernates in the neck of the root, and appears the following season, producing a crop of conidia ; it is therefore important not to plant roots for the purpose of producing seed that were grown in an infected area.

If the disease appears among young plants, spraying with dilute Bordeaux mixture will arrest the spread of the fungus.

## Violet Root Rot.

(*Rhizoctonia violacea*, Tul.)

This very destructive disease is recognised by the presence of a more or less dense violet or brownish-coloured mould on the roots. The life history of this fungus has not been followed; several species have been proposed ; but as suggested by Tulasne, a French mycologist, probably all are forms of one species. When young plants are attacked they usually die gradually, whereas when the root is fleshy death is somewhat sudden ; large holes are formed in the flesh, the surface being covered with the brown mycelium of the fungus. Numerous small dark-coloured sclerotia or compact masses of mycelium are also usually formed in the decaying tissues of the host ; these are liberated in the soil, and enable the fungus to continue its existence from year to year.

The disease occurs in patches in the field, which continue to increase in size. A single beet is first attacked from which the mycelium spreads in the soil, attacking in turn neighbouring plants. Owing to the great number of different kinds of plants on which the fungus can live, it is very difficult to eradicate when it has once gained a foothold. Carrots, turnips, potatoes, lucern and saffron are all attacked. It has been stated that saffron and potatoes have been attacked after an interval of twenty years' rest from such crops on land that had previously produced a diseased crop. Spores or special reproductive bodies are unknown, the fungus reproducing itself from year to year by means of its mycelium and sclerotia. It is very probable that the fungus derives food from various weeds as well as from cultivated plants.

*Preventive measures.*—Good cultivation, alternation of crops and destruction of weeds afford the only means of successfully combating the disease, which fortunately does not attack cereals.

## Beetroot Tumour.

(*Urophylictis leproides*, P. Magn.)

This disease was first observed attacking beetroot growing in the grounds of the School of Agriculture, Rouiba, near Algiers.

The disease is characterised by the presence of one or more brain-like outgrowths or tumours, each attached by a narrow neck

Fig. 4.—Beetroot tumour. 1, appearance of a diseased beet; 2 spores of the fungus, highly magnified.

to the upper part of the beetroot, and originating from rootlets or leaves that are inoculated by the fungus, which in the first instance enters an epidermal cell causing it to swell, and subsequently promoting rapid division and multiplication of surrounding cells, until eventually an irregularly formed mass of tissue results. When fully developed these outgrowths attain a large size, and when cut open present a cavernous or spongy appearance inside, the cavities being filled with masses of dark brown, thick-walled resting-spores, resulting from the conjugation of male and female cells, borne on distinct hyphæ or strands of mycelium.

The mature resting-spores are large, with a smooth, thick, dark brown wall, elliptical, and are produced at the tips of very slender hyphæ which have a globose, colourless swelling just below the insertion of the resting-spore.

Quite recently, the fungus under consideration, or one very closely allied, has attacked potatoes in this country, causing coarse, scabby outgrowths on the surface of the tubers.

*Preventive measures.*—Diseased plants should be removed and burned the moment they are observed ; if allowed to remain and rot on the ground, the liberated resting-spores would endanger future crops.

### White Rust.

(*Cystopus bliti*, De Bary.)

This fungus has only hitherto been observed on sugar-beet in one locality in the United States, but as allied species often prove destructive to other plants, especially those belonging to the Cruciferæ, such as cabbage, radish, horse-radish, &c., it is possible that the mangold and beet may also suffer when attacked under conditions favourable for the rapid extension of the parasite.

The disease is indicated by the presence of pure white shining slightly raised spots about one line across on both surfaces of the living leaves. These patches constitute the conidial or summer form of fruit, and are developed below the epidermis of the leaf, which becomes ruptured when the spores are mature. The spores germinate quickly when placed in water or on a damp surface ; hence those that are washed by rain or blown on to the surface of a damp leaf soon give origin to a new rust pustule, which in turn liberates spores.

Resting-spores or oospores are also formed on the mycelium of the fungus present in the tissues of the leaf ; these remain in an unchanged condition until the following spring, when they germinate, and if young beet or mangold happen to be present, inoculation follows and the conidial condition of the fungus is the result.

*Preventive measures.*—No experiments have been made with the fungus growing on beet, but the allied species—*Cystopus candidus*—infesting crucifers, is known to attack plants only during the seedling stage, and if the same rule holds good in the present instance, diseased plants could be removed when the young plants are thinned out. Old diseased leaves should not under any circumstances be allowed to remain on the ground,

neither should they be given to cattle, on account of the risk incurred of carrying back to the field living resting-spores in the manure.

## Beet-sickness.

(*Heterodera Schachtii*, Schm.)

This most destructive disease of sugar-beet is caused by a minute nematode, better known by the name of eelworm, on account of its shape and wriggling movement when seen under the microscope. It is only the larval or young condition before sexual differentiation and the males that are eel-shaped; the females are lemon-shaped, sluggish, and generally located in the

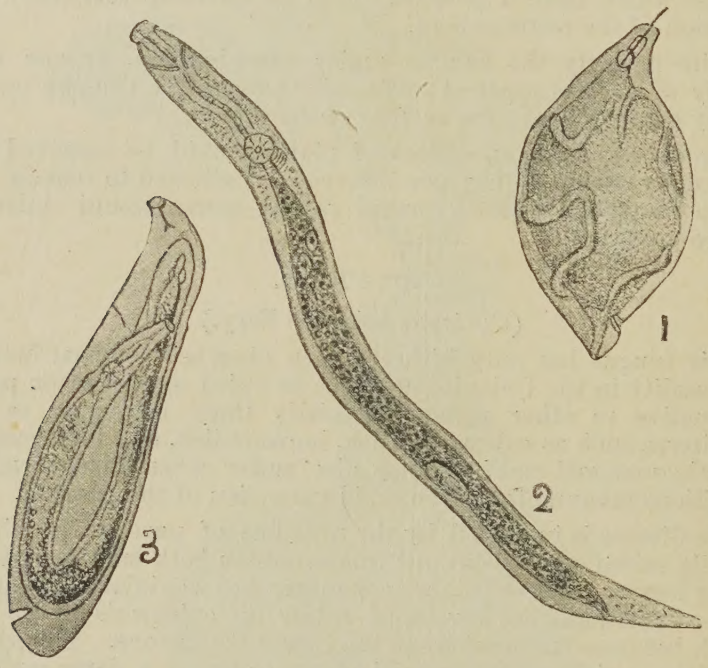


Fig. 5.—Beet sickness. 1, female eelworm; 2, male eelworm; 3, young eelworm yet in the egg; all highly magnified.

small lateral rootlets, where they form whitish warts about the size of a pin's head. The encysted female contains from two to three hundred eggs, which are hatched before leaving the body—in other words, the nematode is viviparous.

During the larval condition the eelworms, after wandering for some time in the soil, penetrate into the tissues of the beet, which are subsequently destroyed.

When a beet is attacked by eelworms the leaves become flabby, yellow, and soon die, the top of the root changes to a blackish colour, and soon the whole decays.

In addition to sugar-beet, *Heterodera Schachtii* attacks mangold, the roots of cereals, many cruciferous plants, as turnips, rape, cabbage, &c.; also some leguminous plants, and probably weeds of various kinds.

The beet eelworm has hitherto been mostly observed in Germany and France, but recently it has been recorded by Professor Percival as attacking the roots of the hop in Kent, causing the disease known as "nettled-headed" hops.

*Preventive measures.*—When land is once infested with eelworm the growth of susceptible crops is impossible, and, notwithstanding the numerous experiments extending over many years made by experts, more especially in Germany, no definite cure is as yet known. The most effective means of partially clearing the soil of the pests, so that a fairly successful crop may be secured, first suggested by Kühn, a German expert, consists in making use of a "trap crop." Summer rape is found most useful on account of its quick growth and large spread of root, which is readily attacked by the eelworms. Success in this direction depends on the prompt removal of the rape when a great number of the larval nematodes have entered the roots, and before a new brood is produced. Lime and salt have also proved of value in diminishing the number of parasites.

## Beet and Potato Scab.

(*Oospora scabies*, Thaxter.)

American vegetable pathologists have demonstrated that the fungus causing potato scab also attacks beet. As potato scab is by no means uncommon in this country, it is very probable that beet and mangold may also be attacked.

The fungus presents a very primitive type of structure, and suggests affinity with the bacteria. It forms rough patches or scabs on potatoes, which are covered with a very delicate grey mould when just dug up, but the mould soon disappears when the potatoes become dry on the surface by exposure to the air. The fungus is capable of supporting itself in the soil when once introduced, consequently a crop becomes diseased if planted in infected soil.

Lime, farmyard manure, ashes, and all substances of an alkaline nature favour the development of the fungus, whereas its growth is arrested by acids.

Sulphur has proved to be the most effective preventive against scab in the case of potatoes, used at the rate of 300 lbs. per acre in the powdered condition, and sown in the drills.

*Preventive measures.*—Beet or mangold should never follow potatoes, especially if scab is known to have existed.

## Heart Rot.

(*Sphaerella tabifica*, Prill. & Del.)

This disease usually manifests itself in August, when the roots have attained to a fairly large size. The first indication of its presence is the drooping of the large outside leaves in a manner similar to that caused by a very hot, dry day, but it will be observed that the leaves have not regained their normal position during the night, and, in fact, never do so. Careful observation of such drooping leaves shows that a considerable portion of the

upper surface of the leaf-stalk presents a bleached appearance, the white portion being bordered by a brown line, and studded with very minute blackish points. These dark points represent one form of fruit of the fungus causing the disease, and before their true nature was known received the following names—*Phoma betæ*, Frank, and *Phoma tabifica*, Prill. & Del.

The mycelium of the fungus present in the leaf-stalks grows downwards until it enters the crown of the root, which is eventually killed; consequently the heart-leaves also perish, the fungus gradually extending into the root, where it is usually aided in the work of destruction by other forms of fungi, bacteria, eelworms, &c.

Later in the season a second form of fruit—the ascigerous condition—appears on the dead leaf-stalks. Judging from analogy, the spores of this second form of fruit will remain in an unchanged condition until the following season, when they will germinate and endanger the crop.

*Preventive measures.*—The early stage of the disease is readily recognised by the drooping and yellowing of the leaves, and when these symptoms are observed such roots should be lifted, as by this means they can be saved before the fungus passes into the crown of the root. Diseased leaves should be collected and buried. If allowed to rot on the ground, or even if given to cattle, the risk of further disease is great.

In August, 1900, some Swede turnips grown in Scotland were referred to Kew for investigation, and were found to exhibit all the symptoms of "heart rot," the general appearance and species of parasite being identical with those seen in beet and mangold attacked by this disease.

## Bacterial Disease of Sugar Beet.

The following features characterize a bacterial disease of sugar beet, said to be not at all uncommon in the State of Indiana, U.S.A.

Every part of the plant is affected, the large outside leaves droop and die early, and the heart-leaves become distorted and change to a yellowish-green colour. Externally the root shows no evidence of disease, but when cut open shows dark rings, which become darker when exposed to the air, sometimes becoming black after a short time.

*Cunningham, Clara A.*, in Proc. Soc. Prom. Agr. Sci., 1898, pp. 141–143.

## Summary.

Beet or mangold should not be grown two years in succession on the same ground; in fact, it is not good policy under any circumstances to grow two root-crops of any kind in succession.

Weeds should not be tolerated, as even when the same kind of crop is only grown at proper intervals its fungus parasite may be supported by weeds during the interval.

The above suggestions, as will be seen, are not new ideas, but resolve themselves into the two old rules—(1) rotation of crops; (2) clean land.

Geo. Massee.

## IX.—BOTANICAL INSTITUTIONS OF JAMAICA.

In the Jamaica *Handbook* for 1901 (pp. 395–400), an interesting account is given by Sir D. Morris, K.C.M.G., of the history of the botanical institutions of that island. As this document has not appeared in subsequent issues of the *Handbook* and is too valuable to be lost sight of, it is now reprinted in the *Bulletin* with the object of rendering it more generally accessible. This account is in some respects supplementary to that already published in the *Bulletin* (Addl. Ser. I., pp. 137–144) in 1898.

### "Public Gardens and Plantations.

"This Department has charge of the following establishments :—

"1. *The Botanic Garden, Castleton*, in the parish of St. Mary, on the road connecting Kingston with Annotto Bay, 19 miles from Kingston and 11 from Annotto Bay, contains a large collection of tropical plants. The chief features are the palmetum and a collection of economic spice and fruit trees. Elevation 496 feet. Annual mean temperature 76.1° Fah. ; average annual rainfall 113.29 inches for 26 years.

"2. *The Hill Gardens*, in the parish of St. Andrew, on the slopes of the Blue Mountains, about 20 miles from Kingston, by way of Gordon Town, lie in the centre of an immense district shortly to be opened up by means of driving roads.

"The Garden was first established by Sir J. P. Grant for experiments with Cinchona, which was so successfully grown that the Government realised about £17,000 by the sale of bark, until the price fell in consequence of the extensive plantations in India, Ceylon and Java.

"Vegetables have also been grown, and instructions given in their cultivation, so that they are now produced in large quantities by all the settlers round.

"There is a nursery for timber trees and an experimental Orange Garden has lately been established at about 3,700 feet.

"Olives, Fruit trees and Tea have been planted ; Fodder plants grown ; experiments made with the variety of Ramie known as China Grass, and other plants of economic interest, all of which will probably be largely cultivated when the driving roads are completed. Elevation 3,500 to 6,300 feet. Annual mean temperature at 4,907 feet, 62.6° Fah. ; average rainfall 102.2 inches for 27 years.

"3. *The Hope Garden*, near the foot of the hills in the Liguanea Plains, 5 miles from Kingston, consists of about 220 acres. The inner portion is being laid out as a Geographical Botanical Garden. There are large nurseries containing about 70,000 plants, such as orange, cocoa, rubber plants, nutmeg, clove, mango, vanilla, cardamon, sarsaparilla, cinnamon, Liberian coffee, etc. Elevation, 700 feet. Annual mean temperature 71.6° Fah. ; average rainfall for 17 years is 51.79 inches.

"4. *Kingston Parade Garden*, the public pleasure garden of Kingston, is kept up with shade and ornamental trees, flowering

plants, and tanks for aquatics. Elevation 60 feet. Annual mean temperature 79° Fah. ; average rainfall for 28 years is 35.16 inches.

"5. *Botanic Garden at Bath*, is the old Botanic Garden of the Colony, established in 1779 ; it is still maintained for the sake of its valuable trees and palms, though much reduced in size. Elevation 170 feet. Temperature 78° Fah.

"6. *King's House Garden and Grounds*, four miles from Kingston, contain about 177 acres, of which about 20 acres are kept up as an ornamental garden attached to the official residence of the Governor. Many valuable economic plants and fruit trees are also under cultivation, as well as the rarer tropical palms and orchids. Elevation 400 feet. Annual mean temperature 78.4° Fah.; average rainfall for 18 years is 48.20 inches.

"The history of this Department is intimately connected with the various vicissitudes through which the island has passed, and since 1774 it has had its periods of depression no less than those of comparative prosperity.

"Directly and indirectly during the last hundred years the Botanical Department has been the means of introducing and propagating some of the most valuable plants, now the sources of the staple products of the island, and its work in this respect is being strengthened and increased year by year.

"It is a striking fact that with the exception of pimento—'that child of nature'—and a few others of comparatively little value, most of the staple products of the island are derived from exotics or plants introduced from other parts of the globe. While on this subject it will be of interest to notice the simple, accidental, or more often direct influences by means of which valuable seeds and plants have been introduced into the island, the mere mention of the names of which is sufficient to recall the vast influences they have exerted for good on the welfare and prosperity of the country.

"The sugar cane though here in the time of the Spaniards was first cultivated by the English, by Sir Thomas Modyford in 1660 (*a*); but its most valuable varieties, the Otaheite and Bourbon canes, were introduced in His Majesty's ships by Captain Bligh as late as 1796. Coffee was introduced by Governor Sir Nicholas Lawes in 1718 (*b*). The mango, brought by Captain Marshall of Lord Rodney's squadron in 1782, was first planted in Mr. East's Botanic Garden (Liguanea), and is now one of the commonest trees in the island (*c*). The plentiful and free-growing logwood was introduced from Honduras by Dr. Barham, a Botanist, the author of '*Hortus Americanus*,' in 1715 (*d*). The beautiful akee was obtained by Dr. Thomas Clarke, first Island Botanist, from a West African slave ship in 1778 (*e*). The cinnamon came with the mango in Captain Marshall's ship in 1782, and was distributed from the Bath Garden by Dr. Dancer. The ubiquitous but graceful bamboo is also an

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"(*a*) *Hortus Jamaicensis*, Vol. II., p. 205.
"(*b*) *Hortus Jamaicensis*, Vol. I., p. 226.
"(*c*) Bryan Edwards' *History*, 5th Ed., Vol. I., p. 257.
"(*d*) *Hortus Jamaicensis*, Vol. I., p. 465.
"(*e*) Bryan Edwards' *History*, 5th Ed., Vol. III., p. 379.

exotic and owes its introduction to Mr. M. Wallen (*a*), who brought it from Hispaniola, and first planted it in the parish of St. Thomas-in-the-East (*b*). For the cherimoyer we are indebted to Mr. Hinton East, who introduced it from South America in 1786 (*c*) ; to Mr. East and his magnificent garden we also owe the jasmines and many species of lilies ; many convolvuli ; the oleander ; the horse radish tree ; numerous roses ; the trumpet flower ; monkey bread ; the camellia ; *Calla æthiopica* ; the weeping willow ; the mulberry tree ; the *arbor vitæ*, and the sweet scented mimosa (*d*). Dr. Clarke, on his arrival as Island Botanist in 1777, brought with him the jujube tree ; and the litchi ; the purple dracæna ; the sago palm and the valuable camphor tree; at the same time there came the now common 'almond' tree ; the tea tree, and the 'sunn' hemp plant (*e*). The wanglo or zezegary was sent by Sir Simon Haughton Clarke in 1801 (*f*). The nutmeg tree, first brought by Lord Rodney in 1782, was re-introduced by Dr. Marter in 1788, together with the clove and black pepper, for which he received the thanks of the House of Assembly and an honorarium of £1,000. The seeds of the valuable and now indispensable Guinea-grass were accidentally introduced from the West Coast of Africa as bird food in 1745 (*g*). Scotch grass received its name from having been first brought from Scotland to Barbados.

" Pindars were brought to Mr. East from South America ; the afou, the acom and Guinea yam, and indeed all but one of the cultivated yams are from the Coast of Africa or East Indies (*h*). The seeds of the guango were brought over from the mainland by Spanish cattle (*i*). Cacao is indigenous to Central America. The shaddock was brought to the West Indies from China by Captain Shaddock, hence its name (*j*). The genip was brought to Jamaica from Surinam by one Guaf, a Jew. The ginger is a native of the East Indies, introduced to Jamaica by a Spaniard, Francisco de Mendiza. The locust tree and blimbing were brought to Jamaica from the South Seas in His Majesty's ship Providence in the year 1793. The orange, both sweet and seville, the lime, the lemon and citron, were brought hither by the Spaniards. The Jerusalem thorn is from the Spanish Main (*k*). The prickly pear is a Mexican plant.

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" (*a*) Bryan Edwards' *History*, 5th Ed., Vol. III., p. 371.

" (*b*) To Mr. Wallen, formerly owner of Cold Spring and Wallenford, the friend of Swartz and a successful botanist, we are, no doubt, indebted for the first plants of the water-cress, chick-weed, wild pansy, groundsel, dead nettles, dandelion, common honey-suckle, black-berried elder, evening primrose, nasturtium, common myrtle, the English oak, white clover and the sweet violet, now common on the Port Royal and Blue Mountains, being, possibly, escapes from his garden at Cold Spring, which even in 1793 was well stocked with choice selections of introduced flowers and European trees and shrubs. Bryan Edwards' *History*, 5th Ed., Vol. I., p. 243.

" (*c*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

" (*d*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

" (*e*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

" (*f*) *Journals Assembly*, Vol. X., p. 638.

" (*g*) *Hortus Jamaicensis*, Vol. I., p. 353.

" (*h*) *Hortus Jamaicensis*, Vol. II., p. 310.

" (*i*) *Macfadyen Flora*, Vol. I., p. 308.

" (*j*) *Macfadyen Flora*, Vol. I., p. 131.

" (*k*) Trans. Roy. Soc. Arts, Jamaica, Vol. I., p. 114.

"Returning, however, to the history of the Department under review, it appears that the first public Garden established in the island was the old Botanic Garden at Bath; and in the *Journals of the House of Assembly*, Vol. VIII., 1784–91, p. 602, mention is made of Dr. Thomas Clarke, 'Practitioner in Physic and Surgery,' who came to the island in 1777, at the particular instance and request of the late Sir Basil Keith, to superintend two Botanic Gardens, then intended to be established in the island. One was to be a European Garden, which however, was not established till long after, at Cinchona, and the other was the 'Tropical Garden' at Bath.

"A private garden possessing many rare and valuable plants had already been formed by Mr. Hinton East in Liguanea (Gordon Town) which, on the death of the founder, became the property of his nephew, Mr. E. H. East, 'who with great generosity offered it to the Assemby of Jamaica for the use of the public at their own price.'

"Mr. Bryan Edwards, in the *History of the British West Indies*, remarks that 'the Assembly of Jamaica, co-operating with the benevolent intentions of His Majesty (to introduce valuable exotics and productions of the most distant regions to the West Indies), purchased in 1792–93 the magnificent Botanical Garden of Mr. East and placed it on the public establishment, under the care of skilful gardeners, one of whom, Mr. James Wiles, had circumnavigated the Globe with Captain Bligh.'

"An interesting catalogue of the plants in this Garden, at the time of Mr. East's decease, was prepared by Dr. A. Broughton, and forms an appendix under the title of 'Hortus Eastensis' to Bryan Edwards' *History of the British West Indies*, Vol. I., p. 475. From it we gather that as early as 1782 the mango, akee, cinnamon, camphor, jack tree, bichy or kola, date palm, rose apple, litchi, turmeric and many valuable plants, numbering nearly 600, had already been introduced into the island and were becoming thoroughly acclimatised.

"From a letter addressed to Sir Joseph Banks by the Botanic Gardener, Jamaica, 1793, we gather that the bread fruit trees* 'were upwards of 11 feet high, with leaves 36 inches long, and the success in cultivating them has exceeded the most sanguine expectations; the cinnamon tree is become very common, and mangoes are in such plenty as to be planted in the negro grounds. There are, also, several bearing trees of the jack or bastard bread fruit . . . and we have one nutmeg plant.'

"The Botanic Garden at Liguanea (as it was called) continued to be under Mr. Wiles' care (superintended by a Committee of the House of Assembly) for many years, while that at Bath was entrusted to Dr. Dancer as Island Botanist. The allowance for the two Gardens was fixed at £800. The duties of the Island Botanist were defined as follows: 'To collect, class and describe the native plants of the island; to use his endeavours to find out their medicinal virtues; to discover if they possess any qualities

"* For his services in introducing the Bread Fruit tree 1,000 guineas were granted in 1793 to Captain Bligh and 500 guineas to Lieutenant Portlock.

useful to the arts, and annually to furnish the House with a correct list of such plants as are in the Botanic Gardens, together with such information as he may have acquired relative to their uses and virtues.'

"For the purpose of distributing the bread fruit and other valuable plants from the Botanic Garden the Committee of the House 'appointed several Committees for each county, to receive and distribute the allotments destined for them,' and, according as sufficient numbers were prepared for propagation, the Chairmen of the County Committees were apprised and their respective proportions delivered and distributed, 'by which means,' it is quaintly remarked, 'the public has derived all the advantages to be expected from these establishments.'

"During the years 1791–1807 the Committee in charge of the Botanic Gardens, with Mr. Shirley as Chairman, greatly developed and improved them. Inquiries were made everywhere for new products; thanks and gratuities were voted for the introduction of valuable plants; and these were cultivated and distributed with great assiduity and care. In order to make the island less dependent on America for supplies every encouragement was given to the cultivation of yams, cocoes, maize, plantain, and such products as the bread fruit, zezegary or wanglo, nutmeg, clove, cinnamon, pindars and coffee, it being believed that the 'cultivation of these valuable exotics will, without doubt, in a course of years lessen the dependence of the Sugar Islands on North America for food and necessaries; and not only supply subsistence for future generations, but, probably, furnish fresh incitements to industry, new improvements in the arts, and new subjects of commerce.' (*a*)

"These beneficial efforts, long and successfully maintained, were however greatly relaxed after the year 1807, and under the influence of domestic trouble, want of due appreciation of the value and nature of Botanic Gardens, or the need of strict economy, a bill was introduced into the House of Assembly in 1810, 'for vesting the Botanic Garden in Liguanea in the Commissioners of the Board of Works, to be sold and the money to be brought to the credit of the public.' This bill was finally passed, December, 1810, and, the Garden passing to private hands, many of the valuable plants contained in it, and collected with so much care and industry, were entirely lost. (*b*)

"The Garden at Bath was however maintained, though in a very reduced state. Dr. Stewart West acted for some time as Island Botanist and was engaged in collecting the plants that had been lost from the Gardens, for the purpose of propagating and distributing them.

"In the year 1824 an effort was made to restore the value and usefulness of the Botanic Gardens, and Sir M. B. Clare, from the Committee appointed to inquire into the state of the Botanic

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"(*a*) Bryan Edwards' *History*, 5th Ed., Vol. I., p. 12.

"(*b*) The land formerly occupied by the Botanic Garden in Liguanea has become the property of the heirs of Mr. Geo. Henderson. Gordon Town is still known as "The Gardens."

Garden, reported : 'That the Botanic Garden in St. Thomas-in-the-East, established more than 50 years ago, has during that period received and transmitted for propagation throughout the island many valuable plants. That the Royal munificence of his late Majesty promoted the object of this institution by vessels-of-war employed to collect plants in the settlements of the east and south seas, some of which are now naturalized in this island, and more might be added, greatly to the advantage of its inhabitants. Your Committee, therefore, recommend that proper care may be taken to preserve the valuable plants which the Garden now contains. That in addition to the above considerations, your Committee are of opinion that one object of this institution of chief importance has never been properly attended to, namely, the investigation of the many unknown native plants of this island, which, from the properties of those already known, it is reasonable to infer would prove highly beneficial in augmenting our internal resources, by supplying various articles either for food, for medicine, or for manufactures, to be cultivated, prepared and exported as staple commodities, by which great commercial advantages might be obtained ; among others the various vegetable dyes claim particular attention as promising a fruitful field for discovery. That it appears to your Committee that the person fit for undertaking such inquiries ought to be a well educated and scientific man, combining with his botanical knowledge sufficient information in experimental chemistry to enable him to discover the useful qualities of such indigenous plants, and improve the productions of those already known ; but at the same time your Committee strongly recommend that such person should not be a medical man, as his whole time and attention ought to be applied to promote the above objects. Your Committee recommends to the House to instruct the Commissioners of Correspondence to direct the Agent to apply for such a person to the President of the Linnean Society in London.' As a result of this proposal Mr. James Macfadyen was selected and approved of as a Botanist, and arrived in the island in 1825.

"At the same time it was felt that the Botanic Garden at Bath was too distant from Kingston and the seat of government to answer the intention proposed, and it was recommended that a bill be brought in for purchasing a proper place for such a Garden in the vicinity of Kingston and Spanish Town.

"This proposal was, however, never carried into execution, and the Garden at Bath, on the removal and death of Mr. Macfadyen, 'fast falling to decay,' was placed in charge of Mr. Thomas Higson ; and his petitions addressed to the House of Assembly during 1830–32 shew that the allowances made were not sufficient for the maintenance of the Garden even in its reduced state, and that no remuneration had been made to him for its superintendence.

"In 1833, in another fit of economy, owing to domestic troubles and the need for retrenchment, a Committee was appointed to 'report on the best means of diminishing the contingencies and expenditure of the island and to consider whether the Botanic Gardens at Bath could be sold for the benefit of the public.'

The report was made at the close of the year and ordered to lie on the table. Nothing further, however, appears to have been done for the Garden till 1840, when the sum of £300 was 'voted for the improvement of the Garden at Bath and for the services of a Botanist.' This sum, afterwards reduced to £200, was placed in the hands of the members of St. Thomas-in-the-East, Portland and St. David, by whom it appears to have been administered down to the year 1852, when the Garden was transferred to the Board of Directors of the Bath of St. Thomas the Apostle. The late Mr. Nathaniel Wilson was appointed Curator of the Garden in 1847, and devoted many years, often labouring under great discouragements, in maintaining and improving the Garden and introducing new plants. His yearly reports contain sufficient evidence of the value of the Garden, small as it was, to an island entirely dependent for its prosperity on its agricultural interest; and assisted and encouraged by the Rev. Thomas Wharton, Mr. Wilson laboured most successfully in the propagation and distribution of valuable plants, and especially in developing the 'fibre' resources of the colony.

"In 1857 a grant was passed by the Legislature for purchasing land for a Botanic Garden at Castleton, in the parish of St. Mary, 19 miles from Kingston, and steps were at once taken to establish the Garden and remove such plants as could be spared from Bath.

"Writing in 1861 Mr. Wilson referred to the successful introduction of seeds of the valuable cinchona tree to Jamaica, 'through the liberality of the British Government and recommendation of Sir W. J. Hooker of Kew.' By the month of October, 1861, Mr. Wilson reported that he had 'over 400 healthy plants quite ready for planting out.' As the climate of Bath was unsuitable for the successful growth of cinchona, by the kindness of the late Dr. Hamilton, they were tried at Cold Spring Coffee Plantation, St. Andrew, at an elevation of 4,000 feet. Here Mr. Wilson found 'the climate and soil to be all he could desire, and as it afforded every facility for carrying out so valuable an experiment he at once availed himself of it, and planted out in the coffee fields, on the 16th November, 1861, several plants of each species, then about 2 and 2½ inches in height. In twelve months after a plant of the red bark (*Cinchona Succirubra*) had attained to the height of 44 inches, with leaves measuring 13½ inches long by 8¾ inches broad. The same plants in December, 1863, *i.e.*, when two years old, measured six feet in height, with 10 branches, having a circumference of stem at a base of 4½ inches.

"In 1862–63 a grant was made for the salary of an Assistant Gardener to Mr. Wilson, and Mr. Robert Thomson, formerly of Kew, received the appointment.

"The Garden at Castleton was then finally established and ultimately, by the influence of Sir John Peter Grant, the Government Cinchona Plantations were opened in 1868, and placed under the management of Mr. Thomson, who, on Mr. Wilson's retirement, had been appointed Superintendent of the Botanic Gardens.

"The export of cinchona bark from the Government Plantation to the 30th September, 1884, was 73,533 pounds of the value of £16,327. There was no exportation in 1885. A consignment

of 150 bags of various qualities was despatched to London in December, 1886. The bark weighed 17,009 pounds and was sold for £542 9*s*. There has been no export since that time.

"Mr. Thomson retired on pension in 1878, and in December, 1879, the Department was placed under the Directorship of Mr. (now Sir) D. Morris. After the appointment of Mr. D. Morris in 1886 as Assistant Director of the Royal Gardens, Kew, the Department was placed under the charge of the present Director, Mr. W. Fawcett, of the Natural History Department of the British Museum.

"In the report of the Royal Finance Commissioners this Department is mentioned as follows :—

"'In a purely agricultural country like Jamaica a well organized Department of Gardens and Plantations is invaluable, not only for introducing and propagating such plants as are most suitable to the climate and soil, but also for the dissemination of the knowledge requisite to cultivate the products of the island to the best advantage. We found that this Department has done good work, and the public appreciation of the opportunities afforded by it is spreading fast.'

"The Department of Public Gardens and Plantations issues a Monthly Bulletin, affording information 'on cultural industries, and on the diseases of plants, on soils, and on native plants.' The Bulletin is supplied free of cost to residents in the Island, and is a most useful agent in the dissemination of information among all classes."

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## X.—BAMBARRA GROUND-NUT.

(*Voandzeia subterranea*, Thou.)

Bambarra, a district on the Upper Niger near Timbuctoo, has in our language given its name to this African ground-nut. Cultivated throughout Tropical Africa from the Sahara to Natal, Bambarra has no pre-eminent claim to the plant, which bears a great variety of native names in different parts of the continent. On the Guinea Coast it is aquing or jubbejubbe, in Bornu mgangala, in Angola viélo, in Unyoro mpande, about Kilimanjaro puo, in Nyasaland litlo. On the Mozambique coast where *Arachis* is called mjugu nyasa, *Voandzeia* is mjugu mawa (mawa=a stone, from the hardness of the seeds, see Grant in *Trans. Linn. Soc.* xxix., p. 8); in the Transvaal it is tindlohu and in Natal inhlubu.

There is no trade in Bambarra ground-nuts, save to a small extent at Zanzibar (see *K.B.*, 1892, p. 88), only the hard starchy seeds are eaten wherever grown, the natives supplying their own needs. In German South-west Africa (see Warburg, *Tropenpflanzer*, iii., p. 169) and in the region of the great lakes this is particularly the case.

It is a mistake to count the nut among African oil-seeds, for as the following analysis by Dr. Thom (*Tropenpflanzer*, l. c.) indicates, the proportion of oil present is insignificant :—

| | |
|---|---|
| Water ... ... ... ... ... | 10·20 |
| Oil ... ... ... ... ... | 4·53 |
| Nitrogenous matter ... ... ... | 19·20 |
| Starch ... ... ... ... ... | 49·91 |
| Phosphoric acid ... ... ... | 0·80 |
| Ash ... ... ... ... ... | 5·13 |
| | 89·77 |

Dr. Thom does not account for the loss of over 10 per cent., but at the same time he does not give any figure for fibre, cellulose, &c., to which presumably the percentage omitted belongs.

In a note by Balland (*Comptes rendus*, cxxxviii., p. 1061) another analysis is given which corroborates the low percentage of fatty matter obtained by Thom. Balland's results are :—

| | |
|---|---|
| Water ... ... ... ... ... | 9·8 |
| Fatty matter ... ... ... ... | 6·0 |
| Nitrogenous matter ... ... ... | 18·6 |
| Starch ... ... ... ... ... | 58·3 |
| Cellulose ... ... ... ... | 4·0 |
| Ash ... ... ... ... ... | 3·3 |
| | 100·0 |

Balland's sample of this Ground-nut, which came from Bangasso in Upper Ubangi, was exhibited at the Paris Exposition among the products of the French Congo as *Haricot-Pistache.*

*Voandzeia subterranea*, the only species of the genus, is undoubtedly a native of Africa, despite the statements of Linnaeus and the botanists who preceded him to the effect that it comes from South America. Schweinfurth and Ascherson (*Aufzahlung*, p. 259) record it as wild on the Upper Nile, and it is stated to be both wild and in cultivation in Senegambia (Guillemin, Perrottet and Richard, *Floræ Senegambiæ Tentamen*, p. 254).

There are several forms in cultivation, differing from one another in the colour and hardness of the seeds. These seeds are about the size of a pea, at times of a pale yellow with a black hilum or point of attachment, at times mottled and ranging through all shades to a very dark brown. Soaked for a night in water and then boiled they are said to form an excellent vegetable. It is further stated (Taubert in Engler *Pflanzenwelt Ost-Afrikas*, B., p. 123) that the red-brown or nearly black seeds become palatable with less cooking than those which are pale in colour or mottled. The younger they are the more pleasant and sweet they taste. They are boiled or fried in butter or oil, or sometimes pounded into a meal. Headaches are said to result from too free a use of them.

Balland states (*Comptes rendus*, l. c.) that when crushed the seeds of *Voandzeia* yield a white flour with a characteristic pulse

odour, but that, when boiled, they have exactly the flavour of chestnuts. He calls attention further to the fact that if we admit the contention of physiologists that the human frame, in order to repair natural loss of tissue, requires daily 120 to 130 grammes of nitrogenous matter, 56 grammes of fatty matter and 500 grammes of carbohydrates, we have, even if the co-efficients of digestibility are taken into account, these elements almost exactly present in a kilogramme of *Voandzeia* seeds. He further remarks that these seeds afford the first instance known to him of a natural substance possessing to an equal degree the chemical features of a complete food.

There is nothing to record concerning the mode of culture save that Pailleux and Bois (*Potager d'un curieux*, ed. 2, p. 568), quoting from a correspondent in the Transvaal, recommend that the growing plants be earthed up.

As the name "ground-nut" implies, the seeds mature under ground. To facilitate the necessary burial of the pod—for none mature that cannot bury (Correa de Mello in *Journ. Linn. Soc.*, xi., 254)—the short, somewhat flattened, hairy branches lie prone on the surface of the earth, often penetrating it where soft and always dipping downwards at the tip. On the primary and a few of the secondary branches are a few leaves, large, erect and trifoliate. The inflorescences, either terminal or from the axils of the leaves, are two-flowered and invariably penetrate the earth unless prevented by some solid body. The flowers thus produced underground, one on each side of a wart-like termination to the axis—may remain subterranean or may reach the surface by the elongation of the pedicel and open as small pale yellow pea-like blossoms. In fruiting the ovary is drawn underground. The subterranean flowers, provided like the aerial with pedicels, lie folded on to these and do not develope any of the conspicuous parts; their petals are absent and so reduced are the stamens that observers have thought them female.

At times all the flowers are aerial, at times all are subterranean; and the earthing-up recommended in the Transvaal has for its object the burying of flowers and fruit.

The fruit is very like that of *Arachis hypogæa*, but is shorter and usually one-seeded at maturity. Though indehiscent, it is bordered by a prominent sutural ridge such as is not seen in *Arachis*. The sides are faintly reticulated, and the total length is about $\frac{3}{4}$ inch.

Although in many respects very like *Arachis hypogæa*, *Voandzeia* belongs to a different tribe of the Leguminosæ being much more closely allied to the Haricot beans.

The Bambarra earth-nut long ago found its way into Brazil where it has passed under the name of Angolan mandubi or earth-nut. India and Malaya have received it and it is cultivated in gardens to a small extent. It has been tried in North Australia and gave a large yield (Mueller, *Select Plants for Extra-trop. Culture*, p. 576), but nowhere has its cultivation assumed any large proportions.

I. H. Burkill.

# XI.—DECADES KEWENSES.

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

## DECADES XL., XLI.

In a previous issue (*Kew Bulletin*, 1906, n. 1.) only six species of the fortieth decade were described. That decade is here completed and an additional decade of diagnoses provided.

397. **Strombosia latifolia,** *Stapf* [Icacinaceae]; species distinctissima ob folia magna obtusissima.

*Rami* ut tota planta glaberrimi, pallide virides vel fuscescentes, 3–4 mm. crassi. *Folia* late oblonga vel elliptica, obtusissima, rarius apice mucronulata, basi late rotundata, 12·5–18 cm. longa, 6–10 cm. lata, supra pallide viridia, subtus lurida, coriacea, costa subtus valida, nervis lateralibus 10–12, venis transversis distantibus. *Flores* pauci in axillis foliorum, arcte glomerulati glomerulis sessilibus. *Pedicelli* brevissimi, bracteis minutis rotundato-ovatis muniti. *Sepala* subrotunda, obtusa, vix 1 mm. longa. *Petala* late linearia, obtusa, apicibus reflexis, vix 4 mm. longa, intus villosa. *Filamenta* petalis arcte adhaerentia, subfiliformia, iis $\frac{1}{3}$-breviora, glabra. *Ovarium* superum, obtuse 5-gonum, truncatum; stylus staminibus aequilongus; stigma subcapitatum, sublobatum.

BORNEO. Sarawak, Bau, *Haviland's* collector, 2,007.

398. **Stemonurus evenius,** *Stapf* [Icacinaceae]; affinis *S. umbellato*, Becc., sed foliis crassioribus eveniis, cymis brevibus valde contractis distincta.

*Ramuli* 5–6 mm. crassi, primo brevissime tomentelli, saepe resina exsudata illiti, demum glabrati, cinereo-ochracei. *Folia* elliptica vel oblonga, obtusissima, emarginata, basi rotundata vel brevissime acuta, 10·8–13 cm. longa, 5–6 cm. lata, valde coriacea, glaberrima, opaca, subtus pallide fuscescentia, glandulis medio depressis obsita, costa subtus valida, caeterum evenia; petiolus 2·5 cm. longus, crassus, supra tenuiter sulcatus. *Cymae* axillares, 10–12-florae, valde contractae, papilloso-tomentellae, pedunculo 1·2 cm. longo vel breviore suffultae; pedicelli subnulli. *Calyx* cupulatus, truncatus vel obscure 5-lobulatus, minute papilloso-tomentellus, 3 mm. longus. *Petala* lineari-oblonga, 6–6·5 mm. longa, apice inflexa, utrinque glabra. *Filamenta* spatulato-linearia, antice sub anthera dense barbata, dorso in apice longe penicillata. *Discus* cupularis, lobulatus. *Ovarium* breviter cylindrico-conicum, glabrum; stylus brevis.

BORNEO. Sarawak, mouth of Sarawak River, *Haviland's* Collector, 1909.

399. **Stemonurus labuanensis,** *Stapf* [Icacinaceae]; valde affinis *S. apicali*, Thw., sed foliorum nervis numerosioribus 3–5 mm. distantibus subtus haud glaucis, cymis minus contractis, bracteis parvis vel saepe minutis distincta.

*Arbor* parva (teste *Motley*). *Ramuli* glabri, juveniles resina exsudata illiti, brunnei. *Folia* obovata vel obovato-oblonga, abrupte breviterque acuminata, basi acuta vel subacuta, 10–11 cm. longa, 5–6 cm. lata, coriacea, glabra, supra lucida, subtus opaca, pallidiora sed haud glauca, costa supra impressa subtus prominente, nervis lateralibus numerosis subaequalibus vel tenuioribus interjectis; petiolus 2·5 cm. longus, teres, supra tenuiter sulcatus. *Cymae* umbellatim congestae, valde contractae, pedunculo 6–8 mm. longo suffultae; ramuli 2 mm. longi vel breviores; pedicelli subnulli; bracteae ovatae, 1 mm. longae. *Alabastra* truncata, apice depressa. *Calyx* cupulatus, latissime brevissimeque 5-dentatus, puberulus. *Petala* lineari-oblonga, apice inflexa, utrinque glabra, vix 4 mm. longa. *Filamenta* spatulato-linearia, dorso in apice penicillata, antice sub ipsa anthera barbata. *Discus* cupularis, undulato-truncatus. *Ovarium* oblongum, sensim in stylum abiens. *Lasianthera apicalis*, Mast. in Hook. f., Fl. Brit. Ind. I., p. 584 (partim, quoad Borneo).

BORNEO. Labuan, *Motley*, 131. Sarawak, Baram, *Ch. Hose*, 107.

Motley's specimen from Labuan was referred by Masters to *Lasianthera apicalis* (= *Stemonurus apicalis*, Thw.) a Ceylon plant. In habit the two are very similar, and the shape and size of the leaves are quite the same in the Ceylon and the Borneo plant; but the leaves of the true *Stemonurus apicalis* are distinctly glaucous, like those of *S. lanceolatus*, Becc., and the nerves are wider (5–6 mm.) apart, the flower-buds are shorter and distinctly convex not truncate and depressed, and the whole inflorescence is contracted into a dense headlike cluster which is subtended by rather large bracts.

400. **Phytocrene porphyrea**, *Stapf* [Icacinaceae]; affinis *P. borneensi*, Becc., sed foliis subtrilobis, capitulis majoribus multo longius pedunculatis (pedunculis 4–6 mm. longis) cinereo-villosis, bracteis summis in caudas rufo-purpureo-barbatas 2·5–3 cm. longas productis distincta.

*Rami* sulcati, setulis rufis patulis obsiti, 6 mm. crassi. *Folia* (unum vidi) e basi cordata subtriloba, acuta, 18 cm. longa, 15 cm. lata, coriacea, utrinque in nervis rufo-setulosa, subtus praeterea ochraceo-tomentosa, 5-nervia, prominenter reticulata, nervis lateralibus supra basin e nervo intermedio ortis utrinque 3; petiolus 8 cm. longus, tomentellus, praeterea setis rufis patulis dense vestitus. *Inflorescentia* e ligno vetusto, pedunculo brevissimo basi bracteis caudato-subulatis crebris vestito suffulta, 12 cm. longa, 3 cm. lata, pendula; rhachis ut rami ramulique cinereo-villosula; rami 12–18 mm. longi, flexuosi; ramuli capituligeri 5–6 mm. longi. *Capitula* globosa, cinereo-villosa, 3–4 mm. diametro. *Calyx* in segmenta 4–5 fissus vel 4–5-lobus; tubus glaber; lobi obovati, obtusi, dorso longe albo-villosi. *Corolla* (juvenilis) campanulatus, ad medium 4–5-loba, lobis acutis, pilis paucis conspersa. *Antherarum* loculi omnino discreti. *Ovarium* rudimentarium subulatum, longe albo-hispidum.

BORNEO. Sarawak, Kuching, *Haviland*, 3140.

401. **Sonerila laeta,** *Stapf* [Melastomaceae] ; affinis *S. maculatae,* Roxb., sed indumento tenuissimo brevissimo denso, caule plane terete, foliis margine eciliatis distincta.

*Herba* erecta, 15 cm. alta. *Caulis* teres, glanduloso-puberulus. *Folia* cuiusque paris subaequalia, petiolata, ovata vel ellipticoovata, symmetrica vel paulo asymmetrica, plus minusve acuminata, basi rotundata interdum uno latere breviore, majora ad 10 cm. longa, ad 5 cm. lata, membranacea, supra saturate viridia et albo-guttata, infra purpurea et viridi-maculata maculis suborbicularibus utrinque correspondentibus, supra minutissime sparseque puberula et interdum e maculorum centro breviter setulosa, infra brevissime sparseque glandulosa-pilosula, margine denticulato-serrata dentibus purpureis haud in setas abeuntibus, pinnatinervia, nervis lateralibus 6–9 (in foliis asymmetricis 4–5 in latere majore) ; petioli 1·5–3 cm. longi, eodem indumento ac caulis. *Cyma* terminalis, contracta, 7-flora, pedunculo ultra 2·5 cm. longo suffulta, undique dense brevissime puberula praetereaque glandulis stipitatis patulis obtecta, ebracteata ; pedicelli ad 4 mm. longi. *Calyx* oblongo-cylindricus, 6 mm. longus, purpureus, dentibus latis obtusis brevissimis. *Petala* oblonga, subacuminata, 6 mm. longa. *Antherae* sulphureae, rostrato-acuminatae, 6–8 mm. longae. *Stylus* 14 mm. longus, stigmate subcapitato.

China. Cultivated by Messrs. J. Veitch & Sons (in 1900) from seeds collected by Mr. *E. H. Wilson.*

402. **Medinilla chionantha,** *Stapf* [Melastomaceae] ; affinis *M. longipedunculatae,* Cogn. et *M. succulentae,* Bl. ; ab illo foliis angustioribus basi longe attenuatis triplinerviis, pedunculis brevibus, floribus majoribus, ab hac imprimis inflorescentiis floribusque multo majoribus differt.

*Frutex* glaberrimus ; rami teretes, griseo-brunnei, ob lenticellos majusculos verrucosi, florigeri ad 6 mm. crassi. *Folia* opposita, subsessilia, lanceolato-oblonga, acuminata, basi longe angustata, in petiolum brevissimum decurrentia, ad 15 cm. longa, 4·5–6 cm. lata, triplinervia, nervis lateralibus circiter 2·5 cm. supra basin ortis. *Cymae* axillares, pseudo-umbellatae, pedunculo communi 10–14 mm. longo, specialibus 1–2 floribus 8–12 mm. longis ; bracteae acutae, minutissimae ; pedicelli graciles, albi, 4–6 mm. longi. *Flores* plerumque 5-meri. *Calyx* niveus, 9 mm. longus, 7 mm. diametro, truncatus, denticulis obscuris viridibus. *Petala* late elliptica, obtusa, 16 mm. longa, 12 mm. lata, carnosa, nivea. *Antherae* aequales, ad 8 mm. longae, connectivo flavescente basi utrinque bilobo lobis aureis, caeterum albae.

Perak. Raised (in 1897) by Messrs. J. Veitch & Sons from seeds collected by Mr. *C. Curtis.*

403. **Achillea sieheana,** *Stapf* [Compositae] ; affinis *A. fragrantissimae,* Sch. Bip., sed caulibus gracilioribus flexuosis, foliis majoribus tenuiusque serrulatis, capitulis radiifloris, corollae basi tandem dilatata spongiosa differt.

*Suffrutex* ramosus 6–7·5 dm. altus, fragrantissimus, ramis tenuibus flexuosis teretibus tenuiter araneoso-villosulis, ramulis numerosissimis brevibus praeditis. *Folia* sessilia, lineari-oblonga, obtusiuscula, minute serrulata, axis primariae 1·2–2·5 cm. longa,

3–5 mm. lata (ramulorum duplo vel ultra minora), dense glanduloso-punctata, adpresse araneoso-canescentia. *Capitula* 3–4 in ramorum apicibus, in corymbum disposita, semiglobosa, 5 mm. longa, pedunculis inaequalibus, infimo ad 18 mm. longa; involucri phylla late oblonga, obtusa, araneoso-villosa; paleae oblongae, obtusae, araneosae. *Flores* ligulati, circiter 7–8; ligulae 2–3 mm. longae, 2 mm. latae, 3-dentatae, aureae; corollae tubus basi paululo ultra ovarii apicem deorsum productus, infra medium tandem dilatatus, spongiosus, anguste bialatus.

Asia Minor. Raised at Kew from seeds collected by Herr *W. Siehe* in Cilicia.

404. **Ardisia gigantifolia**, *Stapf* [Myrsinaceae]; affinis *A. odontophyllae*, Wall., sed foliis multo majoribus in petiolum late decurrentibus, inflorescentia ampliore ex umbellis longiuscule pedunculatis composita, alabastris globosis 4 mm. diametro, antheris obtusis distincta.

*Caulis* crassitie digiti, vix ultra 15 cm. altus, minutissime puberulus, vel glabratus. *Folia* inferiora circa 2–3 cm. distantia, superiora conferta, alterna, elliptica vel longo-elliptica, obtusa, basi in petiolum decurrentia, 30–35 cm. longa, 17–20 cm. lata, in margine revoluto breviter pectinato-fimbriata, bullata, supra saturate viridia, lucida, tenuissime griseo-pubescentia, infra glabra, nervis lateralibus utrinque circiter 12 uti venis infra prominentibus validis; petiolus robustus semiteres, ad 6·5 cm. longus, ob lamina decurrente quasi alatus. *Panicula* longe-pedunculata, 15 cm. longa, laxe ramosa, ex axilla folii admodum reducti e basi lata cordato-ovata lanceolati acuti undulati orta, tenuissime pubescens, cymis umbelliformibus, bracteis subulatis minutis, pedicellis cernuis ad 18 mm. longis roseis. Flores pentameri rosei. *Calyx* tenuissime papilloso-puberulus, segmentis rotundata-ovatis dextrorsum convolutis 2 m. longis. *Corolla* in alabastro globosa, dextrorsum convoluta, aperta semigloboso-cupuliformis, glabra, vix 8 mm. diametro, basi breviter gamopetala, segmentis concavis late-ovatis obtusis. *Stamina* libera; filamenta crassa, perbrevia, imae corollae basi affixa; antherae late oblongae, obtusae, 2 mm. longae, longitudinaliter dehiscentes. *Ovarium* globosum, rufo-papillosum; stylus filiformis, 3 mm. longus; stigma punctatum. *Ovula* circiter 5, placentae hemisphaericae immersa. *Fructus* ignotus.

South China. Cultivated by Messrs. J. Veitch & Sons (in 1901) from seeds collected by Mr. *E. H. Wilson.*

405. **Trachelospermum crocostomum**, *Stapf* [Apocynaceae]; a *T. jasminoidi*, Lem., calyce minore rubente segmentis erectis corollæ tubo basi sanguineo angusto appressis et corollae limbo pallide flavescente ore croceo diversum.

*Frutex* more *Hederae* scandens, ramis gracilibus flexuosis patule pilosis teretibus. *Folia* ovata, elliptico-oblonga vel subobovata, obtusiuscula, interdum obscure acuminata, basi breviter acuta, 1·8–3·8 cm. longa, 1·3–1·8 cm. lata, tenuiter coriacea, glaberrima, supra lucida et saturate viridia, infra pallidiora, nervis secundariis utrinque circiter 8, uti venis laxe anastomosantibus utrinque leviter prominulis; petioli juniores

quidem pilosi, demum ad 4 mm. longi ; stipulae nullae ; glandulae interpetiolares et intrapetiolares in annulum dispositae, purpureae. *Flores* in cymas paucifloras terminales vel pseudo-axillares pedunculatas dispositi, suaveolentes ; pedunculus gracilis, fusco-rubescens, 2·5–6·3 cm. longus ; bracteae minutae, rubescentes, ovato-oblongae vel lanceolatae, acutae ; pedicelli minute bracteolati, glabri, 12 mm. longi. *Calyx* rubescens, 2 mm. longus (rarius paululo longior), glaber, intus basi annulo glandulorum cinctus ; sepala triangulari-ovata vel interiora oblonga, acuta, corollae tubo appressa. *Corolla* hypocrateriformis ; tubus vix 7 mm. longus, a basi ultra medium anguste cylindricus et sanguineus, superne ampliatus, flavescens, ore intus jugis staminibus suprapositis et ad ea decurrentibus papilloso-pilosis instructus ; limbus pallide alutaceo-flavescens, 16 mm. diametro, ore croceo piloso, lobis oblique obovatis obtusis. *Antherae* os attingentes, haud exsertae, 6 mm. longae. *Discus* e segmentis 5 ellipticis obtusis integris formata. *Fructus* ignotus.

China ? A plant of this species has been in cultivation at Kew for many years. It is perfectly hardy. Nothing is known as to its origin, but there is little doubt that it came from China.

406. **Linaria** (§ **Chaenorrhinum**) **gerensis**, *Stapf* [Scrophulariaceae] ; affinis *L. origanifoliae*, DC., sed floribus duplo minoribus et calycis segmentis sursum latioribus corollae tubum subaequantibus differt.

*Herba* perennis. *Caules* graciles, e rhizomate tenui ascendentes, inferne glabri, superne sparse minuteque glanduloso-pubescentes. *Folia* inferiora opposita, superiora sparsa, late elliptica, obtusa, majora 8–10 mm. longa, 8–6 mm. lata, abrupte vel sensim in petiolum 2–4 mm. longum attenuata, glaberrima vel summa (floralia) glanduloso-pubescentia, crassiuscula, siccata plane opaca. *Pedicelli* tenuiter filiformes, flexuosi, ad 8 mm. longi, minute glanduloso-pubescentes. *Calycis* laciniae spathulato-lineares, inaequilongae, postica 4–5 mm. longa, parce glanduloso-ciliatae. *Corollae* tubus subcylindricus, 8 mm. longus, parce pubescens, calcare brevi saccato vix 2 mm. longo ; labium superum lobis subquadratis emarginatis, inferum basi in palatum leviter protrudens inflatum, 3 mm. longum, lobis emarginatis deflexis intermedio paulo longiore. *Ovarium* minute glanduloso-pubescens ; loculi inaequales, uterque ovuliger. *L. rubrifolia*, Boiss., Fl. Or. IV. 383 (partim), non Rob. et Cast. in DC.

Persia. On rocks near Gere, between Bushir and Shiras, *Kotschy*, Pl. Pers-Austr. 92.

407. **Linaria** (§ **Chaenorrhinum**) **Johnstonii**, *Stapf* [Scrophulariaceae] ; affinis *L. rubrifoliae*, Rob. et Cast., foliis omnibus glanduloso-pubescentibus, corollae tubo subobconico, limbo majore, capsulae loculo altero multo minore interdum vacuo diversa.

*Herba* annua, 5–15 cm. alta, tota patule glanduloso-pubescens. *Folia* inferiora opposita, superiora sparsa, elliptica vel oblonga, obtusa, ad 16 (raro ad 20) mm. longa, 4–8 mm. lata, exsiccata subpellucida, concoloria, in petiolum brevissimum vel ad 2 mm. longum attenuata. *Pedicelli* graciles, tandem ad 12 mm. longi. *Calycis* segmenta lineari-spatulata, 5 mm. longa, sub maturitate

paulo accrescentia. *Corolla* purpureo-coerulea ; tubus 4 mm. longus, subobconicus, intus sub palato lineis 2 flavo-papillosis et sub labio supero maculo atro-violaceo notatus, calcare tenui acuto 2 mm. paulo longiore ; labium superum erectum lobis truncatis, inferum 2 mm. longum, basi in palatum pallidum purpureo-maculatum longiuscule protrudens inflatum, lobis subaequalibus obtusissimis vel emarginatis. *Capsula* minute glanduloso-pubescens, diametro 5 mm., loculis admodum inaequalibus, altero majore plerumque irregulariter rumpente vel valvulis 3 brevibus dehiscente, altero saepe minuto indehiscente vel rumpente vacuo vel seminibus perfectis paucis. *Semina* cuneato-oblonga, truncata, costis crebre undulato-denticulatis. *L. minor*, Aitch., Cat. Punjab Pl. 105 ; Hook. f., Fl. Brit. Ind. IV. 252, non Desf. *L. rubrifolia*, Boiss, Fl. Or. IV. 365 (partim).

BALUCHISTAN. Gundava Hill, *Stocks*, 597. AFGHANISTAN. Hindu-Kush, "Kulloo," *Griffith*, 1116 ; Kyber Pass, *H. H. Johnston*, 157 ; INDIA. Punjab, Rawal Pindi, "Hussara," *Aitchison*.

Quite distinct from *L. minor*, Desf., by the broad leaves and the structure of the capsule. Aitchison quotes l. c. "*Fleming*, Salt Range, Vicary, Upper Punjab. *Stewart*, Hazara." I have seen only one specimen from India, collected by Aitchison after the publication of his Catalogue of Punjab Plants, but there is little doubt that Fleming's, Vicary's, and Stewart's plant belong also to *L. Johnstonii*. The capsule-walls are very fragile and break up irregularly, but the larger ovary-cell also dehisces sometimes by 3 small valves at the apex.

408. **Cervantesia glabrata**, *Stapf* [Santalaceæ] ; a speciebus caeteris foliis adultis glabris et inflorescentiarum axibus subglabris diversa.

*Arbor* parva, ramis vetustis teretibus cortice griseo obtectis, junioribus angulatis, novellis cum gemmis griseo-pubescentibus mox glabratis. *Folia* elliptica, apice rotundata, basi breviter acutata, 5–8 cm. longa, 3·5–4 cm. lata, herbacea, integra, adulta glaberrima, nervis secundariis utrinque circiter 5 ut venis laxe anastomosantibus tenuibus ; petiolus 3–5 mm. longus. *Flores* subsessiles, in glomerulos parvos secus rhachin spicae spuriae dispositi ; spicae 1–2, e basi ramulorum saepe admodum abbreviatorum ortae, graciles, 3–4 cm. longae (cum pedunculo circiter 1·8 cm. longo) ; rhachis superne pubescens ; bracteae minutae, oblongae, pubescentes. *Perianthium* in alabastro globosum, apertum, ad 3 mm. longum, extus pubescens, ad medium 5-lobum lobis triangularibus subacutis intus medio barbatis. *Antherae* 1 mm. longae, thecis distinctis rimis singulis dehiscentibus. *Disci* lobi crassi truncati vel subretusi, perianthii segmentis dimidio minores. *Ovarium* in receptaculo ultra medium immersum ; stylus columnaris ; stigma 2–3-lobum ; ovula 2, pendula, ex apice placentae erectae brevis columnaris.

SOUTH AMERICA. Ecuador, *Eggers*, 15,649.

409. **Calathea Gouletii**, *Stapf* [Marantaceae] ; affinis *C. Legrelleana*, Reg., differt statura majore, imprimis petiolis scapisque longioribus, spicae bracteolis (prophyllis specialibus) brevioribus apice vix induratis, floribus albis.

*Folia scapique* basalia. *Foliorum* vaginae ad 10 cm. longae, purpurascentes, glabrae ; petioli purpurascentes, superne imprimis in articulo calloso minute puberuli, ad 30 cm. longi ; laminae oblique ellipticae, acutae, basi rotundatae, 17–23 cm. longae, 8–10 cm. latae, supra basi parce pubescenti excepta glabrae, inter costam pallide viridem et margines saturate virides albo-virides, subtus purpureae, molliter breviterque pubescentes. *Scapi* basi vaginati, 22–45 cm. alti, glabri. *Spicae* subcylindricae, ad 12 cm. longae. *Bracteae* subdistichae, densae, amplectentes, inferiores 8–9 fertiles, circiter 2·5 cm. longae, latae, ad medium bilobae lobis obtusissimis, superiores 4 steriles, summae lanceolatae, ultra 2·5 cm. longae, omnes glabrae. *Florum paria* alborum plerumque 3 cum unaquaque bractea ; bracteolae (prophylla specialia) singulae, lineares, apice vix induratae. *Sepala* lineari-lanceolata, subacuta, 8 mm. longa. *Corallae* tubus circiter 16 mm. longus ; segmenta subaequalia, oblongo-lanceolata, subacuta. *Staminodium* externum petaloideum, obovato-spathulatum, 9 mm. longum ; staminodium callosum cucullatum, stamen aequans, appendiculis 2 (interno anguste lineari externo ovato calloso), late obovatum, subbilobum, 10–11 mm. longum, basi prope stamen callo brevi cristiformi instructum. *Anthera* 2 mm. longa. *Capsula* 9–10 mm. longa, roseo-suffusa. *Semina* grisea 7 mm. longa, areolato-impressa ; arillus 2-lobus lobis imbricatis lateraliter appendiculatis ; ductus perispermaticus indivisus.

Cultivated at Kew under the name *Maranta Gouletii*, Hort. The origin of the plant is unknown.

410. **Digitaria pacifica**, *Stapf* [Gramineae] ; affinis *D. stenotaphrodi*, Stapf (*Panicum stenotaphrodes*, Nees ex Steud.), sed spiculis minoribus collate latioribus, gluma superiore (postica) breviore latioreque et palea valvae inferiori addita distincta (quoniam parva) recedit.

*Gramen* annuum (?), ad 6 dm. altum. *Culmi* fasciculati, erecti, 8–12 nodi, glabri, laeves ; internodia a basi versus medium increscentia (ad 4–10 cm. longa), deinde breviora, summum (pedunculus) elongatum, ad 10 cm. longum. *Foliorum* vaginae laxiusculae, glabrae, laeves, dorso superne carinatae, intermediae et summa saepe internodiis breviores ; ligulae scariosae, truncatae, 2–2·5 mm. longae ; laminae lineares, longe et tenuiter acutatae, 5–15 cm. longae, 5–6 mm. latae, firmae, juniores rigidae, glaberrimae, laeves (etiam in marginibus), nervo intermedio subtus prominulo. *Racemi* (spicae spuriae) 3–5 in culmorum apices digitati, erecti, contigui, 4–4·5 cm. longi ; rhachis applanata, 2–3 mm. lata, glaberrima, laevissima, ob costam tenuem admodum prominentem quasi tri-alata ; pedicelli brevissimi, crassi, secundum costam alternantes. *Spiculae* 2-seriatae, imbricatae, ambitu ovatae vel ellipticae, 2–2·25 mm. longae, 1·8–1·9 mm. latae, pallidae. *Gluma inferior* plane suppressa, raro rudimentaria ope lentis validae visa, *superior* latissime ovata, obtusiuscula, spiculam basi amplectens, 0·3 mm. longa, hyalina, glabra vel minutissime pubescens. *Valva inferior* spicula paulo brevior, obtusa, 5-costata, ad costas et inferne et apicem versus inter eas minute puberula, paleam obovato-rotundatam squamiformem fere 0·5 mm. longam et lodiculas 2 obovatas 0·3–0·4 mm. longas fovens, *superior* ovata,

subacuta, quam inferior angustior, glaberrima, laevis, 3-nervis, subchartacea, margine hyalino latiusculo, cum palea fere aequilonga structura simili et flore hermaphrodito. *Filamenta* ex apice anthoecii exserta; antherae ignotae. *Ovarium* elongato-oblongum; stigmata plumosa, 1 mm. longa, ex apice anthoecii exserta. *Caryopsis* ignota.

POLYNESIA. Christmas Island, communicated by Mr. *J. H. Maiden.*

*Digitaria stenatophrodes* ranges from the Carolines to the Paumotu Archipelago. I have seen specimens from the following localities: Carolines, Ifaluk (Wilson) Island, *Wilkes's Exped.*; Gilbert Group, Uteite, *Powell*, 51; Phœnix Group, Canton Island, *J. J. Lister*; Paumotu Archipelago, Hao (Bow Island), *Hincks*, *Barclay*; Anaa (Chain Island), *Cuming*, 1395; Tataro (King's Island), *Wilkes's Exped.* Another nearly allied species is *Digitaria platycarpha*, Stapf (*Panicum platycarphum*, Trin.), collected by C. Wright (of Ringgold and Rodgers's expedition) on the summits of mountains in the Bonin Islands where it grows in dense patches. These two species and *D. pacifica* form a marked natural group which seems to be quite peculiar to the Pacific Islands. This is the more interesting as all the localities mentioned above, with the exception of Bonin, are low coral islands.

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## XII.—DIAGNOSES AFRICANÆ, XV.

801. **Ochna tenuissima,** *Stapf* [Ochnaceae]; *O. padiflorae* Gilg, proxima, foliis tenuioribus basi magis cuneatis, paniculis longioribus magis ramosis, pedicellis longioribus, floribus paulo minoribus distincta.

*Frutex* humilis, glaberrimus, ramis fuscescentibus gracilibus. *Folia* oblanceolata, breviter acuminata, basin versus longe cuneatim attenuata, toto margine spinuloso-serrata spinulis valde prorsus curvatis, 9–14 cm. longa, 2–4 cm. lata, tenuiter membranacea, laete viridia, nervis lateralibus utrinque 12–15 patulis, venarum reticulatione tenuissima; petioli 2–3 mm. longi; stipulae subulato-filiformes, caducae, petiolis aequilongae. *Paniculae* oblongae, laxae, 5–15 cm. longae, 4–9 cm. latae, ramis racemos elongatos ad 5 cm. longos vel valde abbreviatos referentibus patulis; bracteae caducae, filiformes; pedicelli divaricati, graciles, ad 2 cm. longi. *Sepala* ovata, obtusa vel subobtusa, sub anthesi 3–4 mm. longa, demum paulo longiora. *Petala* spatulata, sepalis aequilonga, flava. *Antherae* sub apice dehiscentes, 1·7 mm. longae. *Stylus* 4–4·5 mm. longus; stigmatis lobi minuti.

UGANDA. Entebbe, 1170 m., *E. Brown*, 345.

802. **Dissotis modesta,** *Stapf* [Melastomaceae]; affinis *D. rotundifoliae*, Triana, differt receptaculo ob glandulas parvas et pilos (paucis majoribus exceptis) minutas sparsas oculo nudo subglabro, appendicibus cum sepalis alternantibus parvis apice stellato-hispidulis, ramis adpresse parceque setosis.

*Caulis* gracilis, acute quadrangularis, parce adpresse setosus setis asperulis parvis basi incrassatis. *Folia* oblonga, acuta, basi

obtusa, margine ciliato minute serrulata, ad 4 cm. longa, 1·8 cm. lata, utrinque hirsuta, 5-nervia nervis extimis supra medium evanescentibus ; petiolus 6 mm. longus. *Flores* 5-meri, pauci, ad ramorum apices congesti ; bracteae ovatae vel ovato-oblongae, acutae, ciliolatae, ad 4 mm. longae, herbaceae. *Receptaculum* oblongum, 6 mm. longum, glandulis parvis et pilis minutis (nonnullis majoribus) asperulis conspersum, oculo nudo fere glabrum. *Sepala* basi latissima, subito lanceolata vel linearilanceolata, 3 mm. longa, ciliolata, cum appendicibus brevibus apice minute stellato-hispidulis alternantia. *Petala* obovatoelliptica, ad 12 mm. longa, 6 mm. lata. *Stamina* episepala antheris coeruleo-purpureis undulato-bullatis 8 mm. longis, connectivo rubescente basi 2 mm. producto antice appendice luteo bilobo subaequilongo instructo ; stamina epipetala antheris episepalis fere aequilongis praeter porum caerulescentem ex toto flavis, connectivo basi breviter producto appendice antico ei aequilongo. *Stylus* purpurascens.

Uganda. Raised at Kew from seeds communicated by Mr. *M. T. Dawe.*

803. **Empogona Allenii,** *Stapf* [Rubiaceae] ; affinis *E. Kirkii, Hook.* f., differt floribus pendulis, multo longius pedicellatis, duplo majoribus.

*Frutex* humilis, divaricatus ; ramuli tenuiter tomentello-pubescentes, cortice griseo-brunneo. *Folia* decidua, ovata vel oblongo-ovata, acuta, basi breviter attenuata (immatura), ad 2 cm. longa, ad 1 cm. lata, supra minute pubescentia, subtus primo fere albo-tomentosa, nervis lateralibus utrinque circiter 6 ; petioli 1–1·5 mm. longi, albo-tomentelli ; stipulae e basi lata triangulari-subulatæ, 3 mm. longae, subpersistentes. *Cymae* sessiles, e ramis annotinis ortae, 6–10-florae, basi perulis rotundato-ovatis latis pubescentibus cinctae ; pedicelli graciles, 3–4 lin. longi, griseo-puberuli ; bracteolae lineari-lanceolatae, ad 1·5 mm. longae. *Receptaculum* obovoideo-turbinatum, griseo-puberulum, 1 mm. longum. *Calyx* 5-partitum, 1 mm. longum, segmentis ovatis obtusis tenuiter membranaceis. *Corolla* alba, suaveolens, in alabastro maturo 12 mm. longa ; tubus subcylindricus, superne paulo dilatatus, 6 mm. longus, extus glaber, ore longe dense villosus villo 3 mm. longo ; lobi oblongi, obtusi, tubo paulo breviores, reflexo-patuli. *Antherae* 5 mm. longae. *Discus* glaber. *Stylus* apice bifidus, 3 mm. e corollae ore exsertus.

Rhodesia. Near the Victoria Falls, in flower in October and November, *C. E. F. Allen*, 55.

804. **Ferretia aeruginescens,** *Stapf* [Rubiaceae] ; affinis *F. apodantherae*, Del., differt foliis junioribus subtus albo-subtomentosis, floribus fructibusque duplo majoribus.

*Frutex* ramis divaricatis, junioribus griseo-tomentellis, vetustioribus cortice pallide brunneo lamellis tenuibus angustis longitudinaliter dissoluto obtectis. *Folia* decidua (juniora ad ramorum apices congesta tantum nota), elliptica, acuta, basi rotundata vel breviter acuta, ultra 2·5 cm. longa, ad 1·8 cm. lata, supra minute pubescentia, subtus albo-subtomentosa (imprimis prope nervos), nervis lateralibus utrinque circiter 6 ; petioli tomentelli, ad

2 mm. longi ; stipulae oblongae, membranaceae, obtusae, cuspidatae, 6 mm. longae. *Flores* 1–2 intra perulas gemmarum scarioso-membranaceas rotundatas orti, cum foliis primis aperti ; pedicelli brevissimi, albo-villosuli, bracteolae lanceolatae vel lineares, 2 mm. longae, scarioso-membranaceae. *Receptaculum* hemisphæricum, albo-tomentellum. *Calyx* 5-partitum ; segmenta linearioblonga e basi plerumque dilatata, apice obtusa, interdum subcuspidata, ad 4 mm. longa, basi tomentella, superne scariosomembranacea, rubescentia, glabra. *Corolla* in alabastro maturo 25 mm. paulo excedens, primo lutea, deinde albescens, exsiccando aeruginoso-virescens (imprimis ad os et secundum nervos) ; tubus infundibularis, ad 16 mm. longus, extus glaber, intus ab ore ultra medium pilosus ; lobi oblongi, obtusi, ad 20 mm. longi, ad 8 mm. lati. *Antherae* 6 mm. longae. *Discus* carnosus, parce minutissime pilosus. *Stylus* 15 mm. longus, medio parce pilosus, superne leviter incrassatus, sulcatus, 2-dentatus. *Ovarii* loculi 2, ovula in utroque loculo 4–5, placentae disciformi insidentia. *Bacca* globosa, 12 mm. diametro. *Semina* compressa, ambitu late oblique elliptica ; testa brunnea, foveolata ; endosperma corneum. *Embryo* 3 mm. longus, horizontalis, radicula cotyledonibus suborbicularibus aequilonga.

RHODESIA. Near the Victoria Falls, *C. E. F. Allen*, 57.

*Ferretia* seems to differ very slightly from *Randia*, the distinguishing characters which are generally adduced—*i.e.*, the slender style, the small number of ovules and the non-immersion of the ovules in the placenta—being not without parallels in *Randia*.

805. **Pavetta luteola**, *Stapf* [Rubiaceae] ; affinis *P. Baconiæ*, Hiern, differt floribus praecocibus pentameris minoribus.

*Frutex* divaricatus ; rami tenuissime villosuli villo longe persistente, cortice pallide brunneus. *Folia* (juniora ad ramorum apices congesta tantum nota) obovato-elliptica vel elliptica, obtusa vel subacuta, ad 18 mm. longa, ad 8 mm. lata, supra minute pubescentia, subtus fere tomentosa imprimis secundum nervos, nervis lateralibus utrinque 5–6 ; petiolus brevissimus ; stipulae e basi lata triangulari subulatae. *Corymbi* semiglobosi ad ramulorum apices, densiflori, 2·5 cm. diametro, griseo-tomentelli ; rami et pedicelli perbreves ; bracteae oblongo-lanceolatae, 2 mm. longae, subscariosae, rubescentes, albo-villosae. *Receptaculum* hemisphaerico-turbinatum, 1 mm. longum, tomentellum. *Calyx* 1·5 mm. longum, 5-partitum ; segmenta elliptica, obtusa, imbricata, subscariosa, rubescentia, *Corolla* lutea, glabra, in alabasro maturo 4-lin. longa, clavata ; tubus subcylindricus, tenuis, ad 4 mm. longus ; lobi 5 lineari-oblongi, obtusi, tubum aequantes. *Stamina* 5 ; antherae exsertae, 3–3·5 mm. longae. *Ovarium* 2-loculare ; ovulum placentae supra medium loculum ortae patelliformi carnosae insidens ; stylus 6–8 mm. corollae os excedens ; stigma integrum.

RHODESIA. Near the Victoria Falls, flowering in October, *C. E. F. Allen*, 54.

806. **Aristolochia** (Sect. **Polyanthera**) **flagellata**, *Stapf* [Aristolochiaceae] ; affinis *A. promissae*, Mast., differt floribus cum foliis

coëtaneis, foliis coriaceis breviter acuminatis conspicue nervosis, perianthii limbo cordato-ovato dentium caudis apice spatulato-dilatatis.

*Frutex* scandens, sempervirens, glaberrimus. *Rami* subcompressi, hinc inde contorti, grosse verrucoso-lenticellati, fusci, nitiduli, internodiis 5–8 cm. longis. *Folia* oblonga vel elliptica, breviter obtusiuscule acuminata, basi breviter acutata, 7–9·5 cm. poll. longa, 3–5 cm. lata, coriacea, nervis secundariis utrinque 4, infimis e basi ortis, intra marginem arcuatim connectis uti venarum reticulatione subtus conspicue prominulis; petiolus circiter 2·5 cm. longus. *Inflorescentiae* cicinnatae, brevissimae, subsessiles, e ramis foliiferis vel vetustioribus ortae; bracteae subulatae, 6–8 mm. longae. *Perianthium* basi inflatum, parte inflata globoso-obovoidea 3–3·5 cm. longa, 2·5 cm. lata, superne annulo intus prosilienti a tubo subcylindrico magis minusue incurvo 5–6 cm. longo ad medium 1·6–1·8 cm. lato intus pilis longis retrosis consperso separata; limbus late cordato-ovatus vel cordato-suborbicularis, circiter 4 cm. latus, 3-dentatus dentibus primo cohaerentibus demum liberis conniventibus sinubus angustis separatis e basi anguste triangulari longe caudatis, caudis filiformibus apicem versus dilatatis acutis 15–18 cm. longis in parte superiore ad 6 mm. latis spiraliter contortis. *Gynostemium* breviter stipitatum. *Antherae* 3 mm. longae. *Stigmatis* lobi 9, antheris subaequilongi, triangulari-lanceolati, undulati, apice cuspidati.

Gold Coast Colony. Aburi Gardens, *Johnson*, 487, 1060.

Mr. W. H Johnson describes the flowers thus: "outside whitish with purplish blotches, inside yellow with purple markings."

807. **Excoecaria Grahami**, *Stapf* [Euphorbiaceae]; affinis *E. guineensi*, Mull. Arg., habitu, foliis minoribus angustioribus haud acuminatis, eorum nervatione, bracteis obtusissimis distincta.

*Suffrutex* 15–30 cm. altus. *Rhizoma* 30–45 cm. sub soli superficie repens, ad intervalla 30–45 cm. ramos ascendentes superne caules 2–3 gerentes emittens, 6–10 mm. diametro, cortice brunneo. *Caules* graciles, juniores virides, demum pallide fuscescentes, glabri, internodiis brevibus vel 2·5–5 cm. longis. *Folia* oblonga vel lanceolato-oblonga, basi obtusa, apice subobtusa, in margine minute glanduloso-denticulata, ima basi utrinque glandula notata 3·5–13 cm. longa, 2·5–4 cm. lata, coriacea, glaberrima, viridia vel juvenilia purpurascentia, nervis utrinque circiter 11–16 patulis marginem versus longe prorsus curvatis plerumque indistincte arcuato-connexis uti venis transversis utrinque prominulis; petiolus 2 mm. longus; stipulae late triangulares, fimbriatae vel in fimbrias solutae, caducae. *Spicae* terminales, ima basi femineae, 1–2 cm. longae, rarius longiores, brevissime pedunculatae, glaberrimae; flores approximati; bracteae roseae, late obovatae vel rotundatae, truncatae, saepe minute apiculatae, 1 mm. longae, basi utrinque glandula viridi vel rosea disciformi addita. *Flos* ♂ pedicello quam bractea paula breviore basi interdum (flores ♂ inferiores) bracteola minute fimbriata minuta suffultus. *Peranthium* roseum, 3-partitum, segmentis ellipticis apice subacuto inflexo, vix 1 mm. longis. *Stamina* 3 antheris subdidymis, filamentis 1 mm. longis inter perianthii segmenta

exsertis. *Flos* ♀ subsessilis, basi bracteolis 2 ovato-rotundatis fimbriatis suffultus : *Perianthium* roseum, 3-partitum, segmentis ovato-orbicularibus obtusis integris vel obscure denticulatis 1·5 mm. longis. *Ovarium* stylo brevi distincto, stigmatibus 3 recurvis. *Capsula* elastice dehiscens, 3-cocca, 12 mm. alta, 18 mm. diametro ; cocci acuti, tenuiter carinati. *Semina* globosa, 5 mm. diametro, estrophiolata, flavida, fusco-maculata.

Gold Coast Colony. Northern Territory, Gambaga, in twos or threes along the roads, or in large patches, *W. M. Graham.*

The rhizomes, according to Mr. Graham, are " very rich in latex, which exudes rapidly from any wound." The plant is well known to the natives, who make use of the latex in the process of tatooing. The vernaculars in the local dialects are, to quote from Mr. Graham's report : 1, Dagonna dial. ; Pampíga : Moshi dial. ; Pulle : Grunshi dial. ; Tullu : Hausa dial. ; Zága Ráfi. (The letters are to be given German values in pronunciation.)

808. **Pennisetum** (§ **Gymnothrix**) **massaicum**, *Stapf* [Gramineae] ; affinis *P. Thunbergii*, Kunth ; differt culmis pluri-(ad 8-)nodis, glumis spiculae dimidio aequilongis vel superiore longiore, anthoecio inferiore plerumque ♂, valvis sensim in mucronem attenuatis, antheris apice obscure apiculatis.

*Gramen* perenne. *Culmi* e rhizomate cataphyllis coriaceis ovatis acutis prominenter nervosis obtecto erecti vel plerumque ascendentes vel basi prostrati, 15–45 cm. longi, pluri-(ad 8-)nodi, glabri, laeves nisi apice interdum asperuli, nodis exsertis, basi innovationes breves intravaginales emittentes, superne simplices vel parce ramosi. *Foliorum vaginae* nervosae, glabrae vel rarius pilis longiusculis tenuissimis conspersae, superiores arctae, ad 10 cm. longae, infimae multo breviores ; *ligulae* ad marginem dense ciliatum reductae, laminae planae, saepe flaccidae, lineares, longe tenuiterque acutatae, 2·5–20 c.m. longae, 2–4 mm. latae, virides, glabrae vel rarius supra pilis tenuibus longiusculis parce conspersae, supra et in marginibus magis minusve asperulae. *Panicula* spiciformis, cylindrica, densa, 1·2–6 c.m. longa, 5–8 mm. diametro, pallida ; rhachis minutissime puberula vel aspera, subsulcata, cicatricibus parvis spicularum delapsarum oblique verticillatis notata. *Spiculae* subsessiles, pallidae, 4–5·5 mm. longae, solitariae ; involucri setae scaberulae, numerosae, longiores spiculas duplo excedentes. *Glumae* tenuiter membranaceae, albidae, ovato-lanceolatae, acute acuminatae, inferior 1-nervis, 2·5–3 mm. lin. longa, superior 5-nervis, 3–3·5 mm. lin. longa. *Valvae* membranaceae, albidae, lanceolatae, sensim in mucronulum attenuatae, 5–5·5 mm. longae, 5-nerves nervis superne prominulis, inferior cum palea et flore ♂ plerumque perfecto. *Lodiculae* nullae. *Antherae* apice minutissime apiculatae, 2 min. longae. *Styli* ima basi connati, tenuissimi, 2·5 mm. longi.

British East Africa. Kikumbuliu, *Scott Elliot*, 6,292 ; Makindu, *Kässner*, 584 ; *Linton*, 72 ; Baringo, 3,400 feet, *Johnston.*

809. **Eragrostis lasiantha**, *Stapf* [Gramineae], affinis *E. hispidae*, K. Sch. ; differt panicula anguste contracta elongata, glumis glabris, valvis a medio sursum sensim attenuatis a latere visis lanceolatis longius pilosis.

*Gramen* perenne, ultra 45 cm. altum. *Culmi* erecti, stricti, tenues, laeves, glabri, paucinodi, internodio summo ad 30 cm. longo longe exserto. *Folia* superiora tantum nota glaberrima; vaginae arctae, tenuiter nervosae; ligulae ad marginem ciliolatam reductae; laminae filiformiter convolutae, tenuissime acutatae, ad 7·5 cm. longae, facie prominenter nervosae, in nervis et ad margines asperulae. *Panicula* contracta, angusta, ad 15 cm. longa, 1·2–1·8 cm. lata; rami solitarii, vel geminati, subcapillares, longiores ad 5 cm. longi, asperuli, ad 4–8 mm. indivisi, tunc parce ramulosi, ramulis 2–4-spiculatis, caeterum simplices; pedicelli tenuiter capillares, 2–8 (rarius ultra) mm. longi. *Spiculae* griseo-olivaceae, ambitu oblongae, ad 6 mm. longae, 8–11-florae; rhachilla gracilis, glabra, ab apice basin versus disarticulata. *Glumae* subaequales, anguste lanceolatae, acutissime acuminatae, 1·75–2 lin. longae, glabrae, hyalinae, 1-nerves. *Valvae* 2–2·25 mm. longae, a latere visae anguste lanceolatae, apice minute truncatae, subhyalinae, nervis conspicuis viridibus, in carina et prope eam minuti pilosae, extra nervos laterales longiuscule pilosae. *Paleae* a latere visae lineari-oblongae, quam valvae paulo breviores, in carinis longiuscule pilosae. *Stamina* 3; antherae vix 1 mm. longae.

British East Africa. Nairobi, Government Farm, *Linton*, 13.

810. **Eragrostis** (§ **Platystachya**) **poecilantha**, *Stapf* [Gramineae]; affinis *E. truncatae*, Hack.; differt vaginis omnibus ipsis infimis glaberrimis, valvis minoribus a latere visis oblique truncatis minus imbricatis.

*Gramen* perenne, caespitosum. *Culmi* subascendentes, cum turionibus foliatis fasciculati, simplices, glaberrimi, 3-nodi, cum paniculis ad 23 cm. longi, internodiis breviter exsertis. *Foliorum* vaginae arctae, glabrae, inferiores subcompressae, 1·8–2·5 cm. longae, prominule nervosae, infimae persistentes; ligulae ad marginem ciliatum redactae; laminae anguste lineares, complicatae, obtusiusculae, 3·5–5 cm. longae, explanatae ad 1–5 mm. latae, margine asperulae, supra villosulae, infra glaberrimae, prominenter pauci-nervosae. *Panicula* angusta, densa, 5–7·5 cm. longa, ad 1·25 cm. lata; rhachis gracilis, tenax, nervoso-striata, laevis; rami solitarii, oblique erecti vel subpatuli, ad 8 mm. longi, simplices vel subsimplices, infimi 5–9-spiculati, superiores 4–2-spiculati, angulares, scaberuli, interdum flexuosi; pedicelli perbreves. *Spiculae* ovato-oblongae, 4–5 mm. longae, 2·5–2·6 mm. latae, 10–16-florae, purpureo-variegatae; rhachilla subflexuosa. *Glumae* subaequales (superior paulo longior), a latere visae lanceolatae, acutae ad 1·5 mm. longae, rigide tenuiter membranaceae, carina rigida scaberula. *Valvae* a latere visae semi-ovatae, apice oblique truncatae, 1·5–1·8 mm. longae, rigidae, apice scaberulae, nervis admodum prominentibus strictis fere excurrentibus. *Paleae* valvas subaequantes, carinis acutis scaberulis. *Antherae* ovato-oblongae, 0·6 mm. longae. *Caryopsis* ellipsoidea, ad fere 0·5 mm. longa, pallide brunnea.

Transvaal. In grassy plains near Pietersburg, 4,000 ft. above sea-level, *Bolus*, 10,857.

## XIII.—NEW ORCHIDS.—DECADE 27.

261. **Bulbophyllum Kerrii**, Rolfe; aff. *B. hirto*, Lindl., sed sepalis brevioribus, petalis latioribus et minute crenulatis facile distinguenda.

*Pseudobulbi* subapproximati, oblongi, circa 4 cm. longi, diphylli. *Folia* oblonga, emarginata, subcoriacea, circa 7·5 cm. longa, 1·2 cm. lata. *Scapus* suberectus, 1–1·5 dm. longus, multiflorus. *Bracteae* ovato-oblongae, acutae, 2–3 mm. longae. *Pedicelli* pubescentes, 3 mm. longi. *Sepalum* posticum oblongum, acutum, concavum, pubescente, 6 mm. longum; sepala lateralia paullo breviora, caeteris similia. *Petala* late elliptica vel suborbicularia, obtusa, crenulata, pubescentia, circa 2 mm. longa. *Labellum* recurvum, oblongum, obtusum, carnosum, canaliculatum, puberulum, circa 2 mm. longum. *Columna* brevis, alis minutis.

Siam. Mountains round Chiengmai, on deciduous trees at about 2,000 feet altitude, *Dr. Arthur Kerr.*

Sent to Kew for determination by Professor Henry H. Dixon, Trinity College, Dublin. It has also flowered at the Royal Botanic Gardens, Dublin, in January, 1901. The flowers are dull yellow and pubescent throughout, and the leaves are deciduous, as in the allied Indian species, *Bulbophyllum hirtum*, Lindl.

262. **Bulbophyllum capituliflorum**, *Rolfe*; habitu *B. intertexti*, Lindl., a qua differt floribus majoribus et in capitulam parvam aggregatis.

*Rhizoma* repens, subgracile. *Pseudobulbi* ovoidei, 6–8 mm. longi, monophylli. *Folia* elliptico-oblonga, apiculata, crassiuscula, subsessilia, 1·6–2·3 cm. longa, 5–6 mm. lata. *Scapi* graciles, 3–5 cm. longa; flores pauci et in capitulam parvam aggregati. *Bracteae* ovatae, acuminatae, 2 mm. longae. *Sepala* subacuta, minutissime puberula, 3 mm. longa; posticum elliptico-oblongum; lateralia ovata. *Petala* oblonga, subobtusa, 1 mm. longa. *Labellum* ovato-oblongum, recurvum, subobtusum, 1 mm. longum, carnosum, margine minute denticulato. *Columna* brevissima, dentes subulati, acuti.

West Tropical Africa.

Flowered in the Royal Botanic Garden, Glasnevin, in October, 1900, where it was received under the name of *Bulbophyllum intertextum*, Lindl., hence, although quite different from that species, it is supposed to have come from the same country. The sepals and petals are pale whitish green, with a suffusion of light purple brown towards the apex, and the lip deep lurid purple.

263. **Calanthe madagascariensis**, *Rolfe*; species *C. sylvatico*, Lindl., affinis, sed minor, foliis multo brevioribus, racemis brevioribus, et bracteis patentibus vel recurvis et multo brevioribus recedit.

*Folia* caespitosa, petiolata; lamina elliptico-ovata vel oblonga, acuta vel breviter acuminata, corrugata, paullo undulata, 8–15 cm. longa, 3–8 cm. lata; petiolus 2·5–7·5 cm. longus. *Scapus* erectus, 4·5–6 dm. altus, puberulus. *Racemus* pauci- vel multiflorus. *Bracteae* patentes vel recurvae, ovato-lanceolatae, acutae, 8–14 mm.

longae. *Pedicelli* 1·2–2·5 cm. longi. *Sepala* et *petala* patentia, late elliptica, breviter acuminata, 1·2–1·4 cm. longa. *Labellum* basi columnae adnatum, lamina triloba, circa 1·2 cm. longa et lata, lobis lateralibus oblongis obtusis, lobo intermedio late obcordato vel bilobo, disco bituberculato et verrucoso, calcare gracili incurvo 2·5–3 cm. longo.—Gard. Chron. 1900, ii. 335 (nomen tantum); Bot. Mag. t. 7780. *C. sylvatica*, Rolfe in Journ. Linn. Soc. xxix. p. 52 (non Lindl.).

MADAGASCAR. *Warpur*; East Betsileo district, *Baron*, 254, 328, 2697, 6555; Fort Dauphin, *Scott-Elliot*, 2357.

Flowered in the Kew collection in August 1900, the plants having been presented by M. Warpur. Dried specimens had previously been doubtfully referred to the Mauritian *C. sylvatica*, Lindl., but it now proves even more distinct than the S. African *C. natalensis*, Reichb. f. (*Bot. Mag.* t. 6844), which was originally considered as a form of the same species. It is very variable in colour, as the plants now flowering include forms with pale purple, lilac, and pure white sepals and petals, while the lip varies from bright purple in the darker forms, becoming paler with age, to yellow in the white forms.

264. **Calanthe Warpuri**, *Rolfe*; ad *praecedenti* accedit, sed labelli lobis lateralibus parvis, lobo intermedio cuneato-unguiculato, calcare reflexo recedit.

*Folia* caespitosa, petiolata; lamina elliptico-ovata, acuta vel breviter acuminata, plicata, paullo undulata, 8–13 cm. longa, 3–5 cm. lata; petiolus 3–7 cm. longus. *Scapus* erectus, 1·5–2 dm. altus, puberulus. *Racemus* circa 8–12-florus. *Bracteae* patentes vel recurvae, oblongo-lanceolatae, acutae, 1–2·5 cm. longae. *Pedicelli* 1·2–1·5 cm. longi. *Sepala* et *petala* patentia, elliptico-lanceolata, acuta, 1·2–1·5 cm. longa. Labellum basi columnae adnatum, lamina triloba, circa 1 cm. longa, 7 mm. lata, lobis lateralibus parvis rotundato-oblongis obtusis, lobo intermedio obcordato-bilobo, basi cuneato-unguiculato, disco tricarinato carinis verrucosis, calcare gracili reflexo vel recurvo 1·5–2 cm. longo.—Gard. Chron. 1900, ii. 335 (nomen tantum).

MADAGASCAR. *Warpur*.

Flowered in the Kew collection in September, 1900, the plants having been presented by M. Warpur. The sepals and petals are pale lilac or white, tinged with light purple, and the lip dark purple with a deep yellow crest.

265. **Cattleya Jenmanii**, *Rolfe*; a *C. gaskelliano*, Sander, foliis multo latioribus, floribus multo minoribus distinctis.

*Pseudobulbi* clavati, subcompressi, basi attenuati, 1·5–1·7 dm. longi, 2·5–4 cm. lati, monophylli. *Folia* elliptico-oblonga, obtusa, crasse coriacea, 1·7–2 dm. longa, 5–8 cm. lata. *Spatha* oblonga, obtusa, conduplicata, 1–1·5 dm. longa. *Scapus* 2–3-florus. *Bracteae* lanceolatae, acutae. 6 mm. longae. *Pedicelli* 5–6 cm. longi. *Sepala* oblongo-lanceolata, acuta, 6–7 cm. longa. *Petala* ovata, obtusa, undulata, 6–7 cm. longa, 4–6 cm. lata. *Labellum* integrum, late ellipticum, retusum, undulatum, circa 6 cm. longum, circa 5 cm. latum; discus laevis. *Columna* clavata, circa 3 cm. longa.

British Guiana. Sources of the Mazaruni River, *Jenman*, 7750.

An interesting species of the *C. labiata* group, which was discovered by the late Mr. G. S. Jenman, Government Botanist, Georgetown, British Guiana, and has now appeared in cultivation, a plant sent home by Mr. Jenman having flowered in the collection of Miss Sinnock, Downford, Hailsham, Sussex. The flowers are rosy mauve, with the front lobe of the lip crimson, and the disc yellow with radiating red-brown veins.

266. **Pteroglossaspis argentina**, *Rolfe;* species americana, generis africani *Pteroglossaspidis* habitu et characteribus consimilis, *P. Carsoni*, Rolfe, affinis, sed segmentis brevioribus et latioribus distinctis.

*Tuber* ovoideo-oblongum, 2·5 cm. longum. *Folia* erecta, lanceolato-linearia, obtusa, basi in petiolum attenuata, circa 3·7 dm. longa, basi vaginis tubulosis 3 v. 4 imbricatis tectis. *Scapus* erectus, circa 6 dm. altus, basin ad apicem vaginis acutis laxis imbricatis tectis. *Racemi* circa 10-flori. *Bracteae* lanceolatae, acuminatae, striatae, 1·2–3 cm. longae. *Pedicelli* 6–10 mm. longi. *Sepala* et *petala* elliptico-oblonga, obtusa, subequalia, 6–7 mm. longa. *Labellum* trilobum, 6–7 mm. longum; lobus intermedius obovato-orbicularis, crenulatus, 5 mm. latus; lobi laterales divergentes, quadrato-orbiculares, 2 mm. lati; discus crassiusculus, obscure verrucosus. *Columna* lata, 4 mm. longa.

Argentina. In praemont. saxos. valle Rio Primero, prope Cordoba, rara, *Stuckert*, 6435.

An extremely interesting plant when viewed from a geographical standpoint, for the four species of the genus hitherto known are all Continental African, and though specifically distinct from these it agrees precisely in habit and structure. Pfitzer's genus *Eulophidium*, perhaps better considered a section of *Eulophia*, has a somewhat analagous distribution, having one species in South Brazil, one in West Africa, a third in the Mascarene Islands, and a fourth in Natal.

267. **Catasetum** (§ **Pseudocatasetum**) **eburneum**, *Rolfe;* species anomalum, floribus eburneis sepalis petalisque reflexis labello crasso-carnoso et columna crassissima facile distinguenda.

*Pseudobulbi* oblongi, 5–8 cm. longi, 5–6-phylli. *Folia* elongato-lanceolata, acuminata, plicata, subtus verrucosa, basi attenuata, 3–3·7 dm. longa, 4–5 cm. lata. *Scapi* suberecti, 3 dm. alti, basi vaginis ovatis acutis obtecti, circa 7-flori. *Bracteae* ovato-oblongae, subacutae, 1·2–1·7 mm. longae. *Pedicelli* circa 4 cm. longi. *Sepala* reflexa, oblonga, apiculata, carnosa, circa 2·3 cm. longa. *Petala* reflexa, elliptico-oblonga, apiculata, carnosa, 2 cm. longa. *Labellum* superum, columnae basi adnatum, erectum, crasso-carnosum, ovato-ellipticum, obtusum, 2 cm. longum, margine integrum, basi late saccatum. *Columna* crassissima, circa 1 cm. longa et lata, ecirrhosa; anthera et pollinia normalia.

Colombia. In the Pamplona district.

Imported from the *Cattleya Mendelii* district by Messrs. Charlesworth and Co., Heaton, Bradford, and flowered in their nursery

in September, 1900. It is an anomalous species, quite unlike any other at present known in the shape and details of the flowers. The pollinia are normally developed and the stigma reduced to a narrow chink, so that the flowers are functionally males, though the column is exceptionally broad. The colour is ivory white, with the single exception of the sac of the lip, which is deep yellow and slightly spotted with brown.

268. **Aëranthes ramosa**, *Rolfe;* ab *A. dentiens*, Reichb. f., differt, scapis longissimis tenuioribus ramosis, floribus minoribus, segmentis parum acuminatis.

*Folia* oblonga, obtusa, inæqualiter et breviter biloba, 1·2–2 dm. longa, 2–4 cm. lata. *Scapi* 4·5–6 dm. longi, gracillimi, ramosi. *Bracteae* late ovatae, apiculatae, cucullatae, 4 mm. longae. *Pedicelli* 1·3–2 cm. longi. *Sepala* late ovata, breviter acuminata, 1·8–2·5 cm. longa. *Petala* late rhomboideo-ovata, breviter acuminata, 1·5–2 cm. longa. *Labellum* cordato-ovatum, acutum, 1·5–1·8 cm. longum; calcar clavatum, obtusum, 8–12 mm. longum. *Columna* lata, brevissima, alis semiovato-oblongis, obtusis.

MADAGASCAR. At Tananbe, *Warpur*.

Flowered with Mr. F. W. Moore, A.L.S., Royal Botanic Garden, Glasnevin, in October, 1901, and proves identical with a plant collected by Mr. Warpur. It is remarkable for its long, slender, branched scape. The flowers are dull olive-green in colour.

269. **Habenaria triquetra**, *Rolfe;* affinis *H. pectinatae*, Don, sed ovario triquetro v. fere trialato, labelli lobis subaequalibus, lobo intermedio non recurvo, et staminodiis linearibus facile distinguenda.

*Planta* circa 3–4·5 dm. alta. *Folia* radicalia patentia, ovato-lanceolata, subacuta, amplexicaulia, 2·5–7·5 cm. longa, 2–3 cm. lata; caulina patentia, oblonga v. oblongo-lanceolata, acuta, amplexicaulia, trinervia, parce glaucescentia, 6–10 cm. longa, 2–3 cm. lata; vaginae tetraquetrae. *Racemi* circa 10-flori. *Bracteae* foliaceae, supra sensim decrescentiae, 3–7·5 cm. longae. *Ovarium* subsessile, triquetrum v. fere trialatum, 1·5–2 cm. longum. *Sepalum* posticum elliptico-oblongum, apiculatum, circa 2 cm. longum, 8 mm. latum; lateralia oblique lanceolata, apiculata, circa 2 cm. longa, 5 mm. lata. *Petala* suboblique lanceolata, subacuta, circa 2 cm. longa. *Labellum* circa 2 cm. longum, trilobum; lobus intermedius oblongus, obtusus, 8 mm. longus; lobi laterales obliqui, extus profunde laciniati laciniis subcapillacei; calcar subcylindricum, circa 2 cm. longum, fauce paullo ampliatums. *Columna* lata; staminodia linearia, arcuata, 2 mm. longa; antherae canales incurvae, suberectae, 2 mm. longae; processus stigmaticis clavati, arcuati, 4 mm. longi.

SHAN STATES. *Hildebrand.*

Sent from the Shan States by A. H. Hildebrand, Esq., C.I.E., and flowered in the Kew collection in July, 1903. The plant is somewhat glaucous, the sepals are light green, and the petals and lip white.

270. **Cynorchis villosa**, *Rolfe;* affinis *C. gibbosae*, Ridl., sed foliis non solitariis, inflorescentiis insigniter villosis, floribus minoribus, et calcare brevi facile distinguenda.

*Folia* elliptico-oblonga, acuta vel breviter acuminata, margine undulata, 1–1·5 dm. longa, 4·5–7·5 cm. lata. *Scapi* erecti, 1·5–3 dm. longi, plus minusve villosi, basi vaginis ovato-lanceolatis obtecti; racemi ovoideo-oblongi, 5–9 cm. longi, villosi, multiflori. *Bracteae* ovato-lanceolatae, acuminatae, villosae, 6–12 mm. longae. *Pedicelli* 1·2–2 cm. longi, villosissimi. *Sepalum* posticum ovato-oblongum, apiculatum, subcucullatum, extus villosum, 6 mm. longum; sepala lateralia ovato-oblonga, apiculata, concava, extus villosa, 6 mm. longa. *Petala* obliqua, glabra, 5 mm. longa, unilateraliter dilatata, crenulata, supra medium subito constricta, apice obtusa vel truncata. *Labellum* 5 mm. longum, late pandurato-oblongum, apice trilobum, lobis late rotundatis, disco laeve; calcar oblongum, inflatum, 5 mm. longum. *Columna* lata; antherae appendices 3 mm. longae.—*Bot. Mag.* t. 7845.

N.E. MADAGASCAR. Tananbe, in ravines, *Warpur*.

A striking species, on account of the very villous, many-flowered inflorescence. The flowers are lilac-purple, with the lip and the lower part of the petals white. The ovary is light green, but its hairs—like those of the back of the sepals—are lilac-purple. It flowered at Kew in September, 1901.

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## XIV.—MISCELLANEOUS NOTES.

Mr. THOMAS W. MAIN, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent of Government Plantations, Selangor, Federated Malay States.

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Mr. JOHN L. WILLIAMS, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Botanic Station, Lagos, in succession to Mr. E. W. Foster (p. 48).

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